Sky and TELESCOPE

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OPENING ADDRESS IAU ROME MEETING

BERTIL LINDBLAD, *President, IAU*

THE International Astronomical Union returns with its present eighth general assembly to Rome, where the first meeting of the union was held 30 years ago, in May, 1922. The union was founded, together with a number of other scientific unions, by the International Research Council at Brussels in 1919. As Rome was the place of the first general assembly, we may say that the union actually has its birthplace here. The union is proud of this fact. The majesty of age and traditions makes Rome a city of incomparable greatness. The assembled weight of 27 centuries of cultural development impresses us as deeply as it does every civilized person on this earth, even though we astronomers are used to seeing the world **sub specie aeternitatis.** The capital of the Roman empire, the center of the civilized world for a great many centuries, that is how ancient Rome stands before us in all its splendor, mysterious and overwhelming in its power. But centuries pass and it is not only ancient Rome which attracts our interest, but above all modern Rome as the capital of Italy. In Rome, as it meets us today, we see the center of cultural life in modern Italy, a development which proceeds vigorously on a basis of some of the oldest and finest traditions in the world. This cultural development is, and has been, particularly strong in science. . . .

One of the most prominent names which meets us in medieval Italian astronomy is Paolo del Pozzo Toscanelli. He was not only an astronomer, but also a geographer. To most of us Toscanelli's name first occurred in a special connection . . . [for Columbus used] the map of Toscanelli. It was not the fault of Toscanelli that the American continents were not on the map. Its importance was that it served as a source of inspiration for this great enterprise, one of the boldest endeavors in the history of mankind.

In the next century, we know how Copernicus as a young man came to the University of Bologna. He stayed 10 years in Italy. A new time was now approaching in the development of natural science, and especially at this point of the history of science we are tempted to ask if the great men actually create the extremely rapid progress or if the great discoverers appear because the time is ripe for their work. We know to what immense extent the new era is marked by the works of Galileo Galilei, one of the greatest men of science of all times, born at Pisa in 1564. His scientific activity began when he took up teaching mathematics and astronomy at the University of Pisa. Among his discoveries we should be inclined to give the foremost rank to his formulation of the laws of motion which laid the foundation of dynamics. . . .

In 1669 Giovanni Domenico Cassini, professor of astronomy at the University of Bologna, was called by Louis XIV to be director of the Paris Observatory. He was considered the foremost astronomer of his time, and his immense activity was of the greatest importance for the progress of astronomy in the 17th century.

Time permits me to mention only a few of the outstanding names of the 18th and 19th centuries. Piazzi founded the Observatory of Palermo. After 20 years of work with a vertical circle made by Ramsden he published a catalogue with the positions of 7,646 stars. On the night of the first of January, 1801, he discovered accidentally the first of the minor planets. . . . Donati in Florence was one of the first to study stellar spectra. With a visual spectroscope he observed the spectra of 15 stars and described their principal lines of absorption. This was followed up by Secchi in his well-known work which proceeded parallel with simultaneous work by Rutherfurd in New York and Sir William Huggins in England. Secchi is one of the great pioneers of astrophysics, who actually gave the first useful system of classification for stellar spectra. He was also a pioneer in solar physics, and his publications, especially his textbook on the

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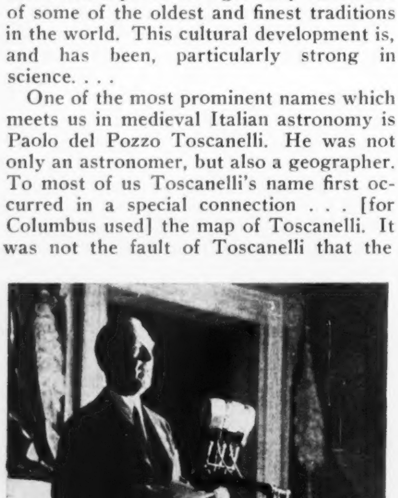

Dr. Bertil Lindblad, Stockholm Observatory, delivering the opening presidential address to the International Astronomical Union, September 4, 1952. Photo by Otto Struve.

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COVER: A view of the audience at the inaugural session of the International Astronomical Union, which was held in the Campidoglio, in Rome, on September 4th. The opening address by President Bertil Lindblad appears on this page. Photograph by Celerfoto, Rome. (See page 3.)

BACK COVER: The galaxy NGC 4631, in Canes Venatici, at $12^{h}\ 39^{m}.8$, $+32°\ 49'$ (1950). A large, late-type spiral, seen edge on, its apparent dimensions are 12.0 by 1.2 minutes of arc, and its total integrated magnitude is 9.6. The Herschel designation is H V42, Herschel's class V indicating a very large nebula. In Norton's **Star Atlas** this galaxy is plotted as 42^{5}. The small companion galaxy is NGC 4627. Photograph by the 200-inch Hale telescope, Mount Wilson and Palomar Observatories.

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Ancient Rome was of great interest to modern astronomers who attended the assembly of the International Astronomical Union this September. The arch of Septimius Severus (left) and the Forum Romanum (right), as seen from a balcony outside the office of the mayor of Rome in the Campidoglio. Photographs by the author.

REPORT FROM ROME

BY OTTO STRUVE, *Leuschner Observatory, University of California*

NEARLY 500 delegates from 35 countries and an equal number of guests gathered, on September 4th, at the ancient Rome Campidoglio — once the home of the famous observatory of Respighi — to hear President Bertil Lindblad's opening address of the eighth general assembly of the International Astronomical Union. The mayor of Rome welcomed the scientists on behalf of the city, and the minister of education, himself an amateur astronomer, spoke for the Italian government. Professor Gustavo Colonnetti, president of the Italian National Research Council, the host institution, gave an address in which he said:

"Not for the first time in this historic hall do I welcome, in the name of the National Research Council, illustrious men of science from all parts of the world as guests of the mayor of Rome. Previously it was a particular branch of science that they represented; a new chapter of human knowledge with its peculiarities, with its merits, with its charm. But never before did I either approach scientists or speak to them with such a feeling of mysterious fascination as I have today, before you who are devoted to the science of the stars, queen of all other sciences. . . .

"It is you, the scrutinizers of the firmament, who have offered to the mind of man what we inadequately may attempt to call the concrete feeling of the infinite; it is you who have taught man to penetrate beyond these boundaries of our small world which limit our experience; it is you who, with the panorama of thousands and millions of light-years, have shown us a universe whose dimensions in space and time appear beyond the measure of our thought and transcend our imagination, shaped by nature in proportion to our senses and to our capacity for sense perception.

"It is you who have offered to our most daring mathematical conceptions the immensity of creation as a hunting ground for experiment; it is you who have taught us to evade the classical conceptions of absolute time and Euclidean geometry.

"Some among you who participated in the first general assembly of the International Astronomical Union, held here in Rome in 1922, may still remember the words in which Vito Volterra, president of the organizing committee, then stressed the importance of the experimental evidence by which astronomy made possible the abstract speculation on motion. The program of that assembly included a study of problems of relativity in astronomy, and at that time no one could foresee the progress made on the basis of observations of the eclipse of the sun in 1919.

"In his opening speech, Volterra pointed out that modern astronomy, with its immense distances, the enormous number of the celestial bodies, the centuries and centuries of accumulated experience and uninterrupted observations, and the wonderful precision of its instruments, can multiply the tenuous effects of those phenomena which under ordinary experimental conditions would be imperceptible. He stated that 'without astronomy the velocity of the propagation of light would never have been discovered.'

"And it is you again, astronomers,

The executive committee of the IAU (except for the president, who was then delivering his opening speech), seated, left to right: P. T. Oosterhoff, Netherlands; A. Danjon, France; O. Struve, U.S.A.; H. Spencer Jones, Great Britain; G. Tiercy, Switzerland; V. A. Ambarzumian, U.S.S.R.; J. H. Oort, Netherlands; B. Stroemgren, U.S.A.

The Aula Magna building at University City, where large general meetings were held (directly back of the main entrance). The Institute of Mathematics, where the commissions met, is off the picture to the right, at the end of the plaza. Vera photograph.

who by catching the faint rays which reach us from remote space, and by discovering unthought-of characteristics of their sources, have shown us how to measure the distances of the stars, their velocity, their temperature, their mass, their structure. . . .

"It is with an almost religious respect that the scholars of all the other branches of science welcome you today and express to you the wish that your meditations may lead you to an ever more intimate comprehension of natural phenomena, which arouse in us a sense both of humility and of admiration. . . ."

Of special interest to the astronomers, and the highlight of the first day of the meeting, was the speech by Professor Giorgio Abetti, the principal organizer of the meeting. The youngest looking man of 70 this reporter has ever met, he represents all that is fine and noble in Italian science. His own research work in solar physics and his administration of the Florence Observatory at Arcetri are well known to our readers. What is perhaps not so well known is the fact that he has attended all the eight assemblies the IAU has held, beginning 30 years ago in Rome. The son of Antonio Abetti, then the director of Arcetri Observatory, young Giorgio quickly distinguished himself. Today he is universally recognized not only as Italy's senior astronomer but, especially, as a true internationalist in science who has served the IAU as vice-president almost continuously since 1928.

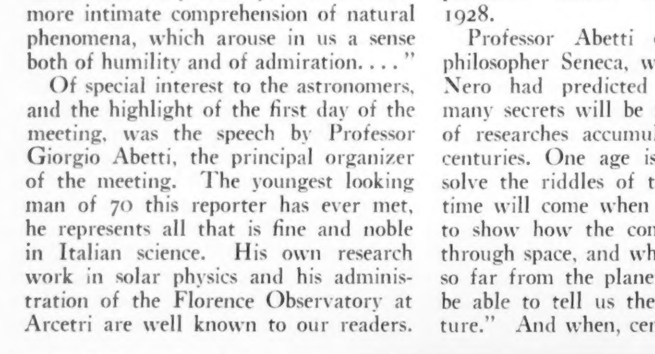
Professor Abetti quoted from the philosopher Seneca, who at the time of Nero had predicted "that some day many secrets will be revealed by means of researches accumulated through the centuries. One age is not sufficient to solve the riddles of the heavens. The time will come when man will be able to show how the comets are traveling through space, and why they wander off so far from the planets. He will even be able to tell us their size and structure." And when, centuries later, Galileo spoke of the "Atlantic task that confronted those who would wish to describe the celestial sphere with its innumerable flock of fixed stars" he pointed the way to an organization such as ours.

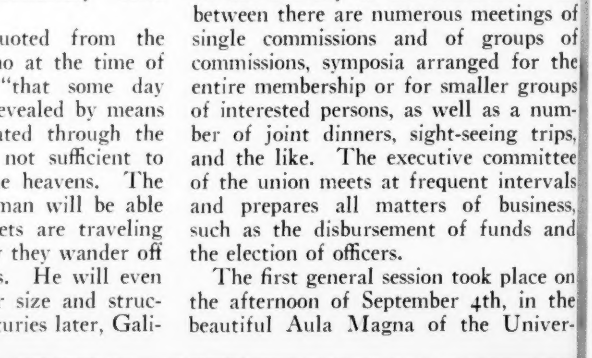
The union itself, Abetti continued, derived its inspiration "from the great personality of G. E. Hale through his organization of the International Union for Solar Research."

In conclusion, Abetti spoke briefly on the history of astronomy at Rome — the old observatory on the Campidoglio, the ancient Roman College founded by the Jesuits in 1550 where "Christopher Clavius, after the celestial discoveries of Galileo, had so much difficulty in seeing the satellites of Jupiter," but where soon afterwards the ideas of Galileo blossomed in their greatest brilliance through the *Sidereus Nuncius Collegii Romani* of Father Odo van Maelcote. Abetti also spoke of Father Secchi and the difficulties he encountered in introducing physical astronomy into the recognized sciences. His effort finally succeeded, and to Secchi we are indebted for the rapid development of astrophysics at Oxford, Berlin, Paris, Calcutta, and elsewhere, all of which were founded after Secchi had introduced the idea that physical astronomy was on a par with positional astronomy.

The regular meetings of the IAU usually consist of one general session at the beginning, attended by all the members and of another general session on the last day of the conference. In between there are numerous meetings of single commissions and of groups of commissions, symposia arranged for the entire membership or for smaller groups of interested persons, as well as a number of joint dinners, sight-seeing trips, and the like. The executive committee of the union meets at frequent intervals and prepares all matters of business, such as the disbursement of funds and the election of officers.

The first general session took place on the afternoon of September 4th, in the beautiful Aula Magna of the Univer-





Informal gatherings, large or small, are an important part of an international meeting such as this one. From left to right are: L. Gratton, Argentina; J. F. Heard, Canada; A. Van Hoof, Belgium; E. C. Krueger, Italy; Mme. D. Chalonge, France; and Frau and Dr. A. Unsold, Germany. Photos by the author.

sity of Rome. President Lindblad presented his report for the past four years, since the meeting in Zurich. Despite many great difficulties the union has continued to forge ahead and it is now better and stronger than it was in 1948. The normal activities of collaboration between astronomers of many lands have been continued and extended. New symposia have been organized, not only at the general assemblies but in the intervals between. Those on fundamental constants, arranged by A. Danjon in Paris, and on problems of turbulence, arranged by a group of workers under J. H. Oort, were exceptionally successful. The present meeting with its four great symposia no doubt will set the pace for future assemblies.

Dr. Lindblad's own initiative has brought about a marked improvement in the work of the numerous commissions. Instead of scheduling many individual meetings for each commission, with little opportunity for scientists to mix except at the relatively few general gatherings, several groups of commissions were formed to meet together. This plan has worked out very well.

On the organizational side, Dr. Lindblad referred to the difficulties he had encountered, as in the case of the regrettable necessity for the cancelation of the meeting originally scheduled for Leningrad. He also highlighted some of the successes that *we* all know were largely brought about by his leadership: the admission of Germany, which healed a wound that had harmed the union from its beginning; the splendid co-operation of the Soviet astronomers, who went far beyond anything that might have been thought reasonable in continuing their important work in the IAU despite the unfortunate necessity of canceling the meeting in Russia; the reorganization of the nominating committee on commissions, whose work at former meetings had been somewhat haphazard and sometimes resulted in some unintentional slights to astronomers who should have been nominated but were somehow overlooked; the continued emphasis upon membership in the union by nomination from national committees without requiring participation of every astronomer in a commission, and the subsequent tendency to reduce the numbers of persons in the commissions — this is an important change because several commissions had become so large as to be entirely unwieldy.

A speech of great importance was delivered at the opening session by vice-president V. A. Ambarzumian. It came somewhat unexpectedly, since customarily invitations are discussed on the last day of the conference. Nevertheless, it was a legitimate declaration by one of the vice-presidents who at the same time headed the delegation from the Soviet Union. Delivered in Russian, it was

Left to right: H. L. Vanderlinden, Belgium; S. Rosseland, Norway; A. Severny and V. A. Ambarzumian, U.S.S.R.; O. Struve, U.S.A.; B. Kukarkin, M. Zverev, and J. Riabov, U.S.S.R.

subsequently translated into English and French:

"The work of the IAU has a single purpose: to strengthen international co-operation in our science. The Soviet delegation recognizes with satisfaction that during the past few years there has been an ever-widening effort to increase the ties that bind the astronomers of the entire world. Since the Zurich meeting of the IAU, the Soviet astronomers have made every effort to participate in this movement. They have increased their participation in international programs — some of which have required much work, such as the compilation of catalogues of variable stars and the preparation of the ephemerides of minor planets.

"Because the Soviet astronomers attribute enormous importance to the exchange of scientific information, they have taken part in the work of nearly all the commissions of the IAU. There has been a sharp increase in the number of publications which we have sent to other countries. A number of foreign astronomers have visited the Soviet Union during the past four years. Soviet astronomers have taken the initiative in organizing two symposia for the present meeting, that on stellar evolution and that on the astrometry of faint stars.

"Unfortunately, the unprecedented cancelation by the executive committee of the meeting scheduled for 1951 in Leningrad — a meeting that had previously been unanimously agreed upon — has severely injured the cause of international co-operation.

"Desiring to correct this error, the Academy of Sciences of the U.S.S.R. renewed its invitation, this time for 1952, at the Paris conference of the executive committee, a year ago. We regret that this invitation was not accepted. In our opinion the cancelation of the Leningrad meeting was caused by nonscientific considerations. It has produced the impression that the real cause of the cancelation was a wish to prevent astronomers of other countries becoming better acquainted with the work of the Soviet astronomers; a wish to stir up discord in the IAU and thus to prevent an increase in the fruitful collaboration of astronomers on an international scale.

"Despite these facts, the Soviet scientists will continue to work tirelessly toward the strengthening and the increase of international ties in the field of as-

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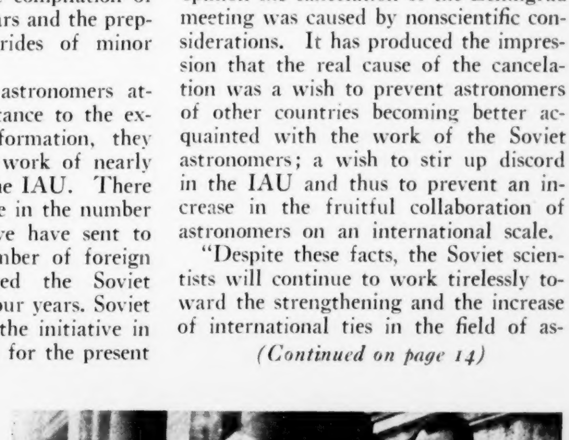


Left to right: D. Taboada, amateur astronomer from Mexico; I. S. Bowen, director, Mount Wilson and Palomar Observatories; and L. Muench and G. Haro, of Mexico. Photograph by the author.

The author's models of "today's" telescope mountings. At the top are Models I through IV, the German, cross-axis, fork, and yoke mountings. Below are Models V to VII, the altazimuth, coude, and horizontal or siderostat. Although only approximately to scale, the models were photographed in groups at the same distance from the camera. Some idea of size can be obtained by noting that the diameter of the tube in Model II is one inch and its length is six inches.

Mountings of Today and Yesterday

By O. M. Erpenstein, *Eastbay Astronomical Society*

HOW TO MOUNT an instrument that is in process of construction is a problem that confronts every telescope maker of today, particularly the amateur, just as it was a problem for the old-timers, especially those ambitious enough to construct large reflectors, or refractors of prodigious length. In the endeavor to arrive at a decision for myself as to the best type of mounting, I perused much of the literature, old and modern, and in the course of the investigation many unusual and interesting mountings came to light. The accompanying illustrations of small models by no means exhaust all the possible schemes, but they include the major types, as well as others that we now would never dream of using.

Model I is the conventional German or Fraunhofer equatorial type best suited to refractors. It requires a counterweight, and when used for a reflector, provision should be made for the tube of the telescope to be turned on its axis, in order to avoid some awkward positions of the eyepiece. It has the disadvantage that when observing or photographing near the meridian it is often necessary to reverse the telescope from one side of the pier to the other to avoid striking it. Most amateur mountings are of this type. The largest refractor in the world, at Yerkes Observatory, is mounted in this manner.

Model II is nearly the same as the preceding, the difference being that the declination axis lies between the two bearings for the polar axis. In this cross-axis type, a counterweight is required, but greater stability is insured than that of Model I. Unlike the German mounting, it need not be reversed upon reaching the meridian. A number of photographic instruments are mounted this way; the Jewett Schmidt telescope at the Agassiz station of Harvard College Observatory is an example.

The fork type of mounting is shown by Model III. Here no counterweight is necessary, but for general stability the fork and the polar axis must be of very generous proportions. It is proposed to mount the 120-inch reflector of Lick Observatory on a fork mounting which will then be the largest in operation. The 60-inch of Mount Wilson is a large fork-mounted reflector.

Model IV shows the English or yoke equatorial. A counterweight is not needed, but of course the two side struts must be very rigid. This is the mounting used with the Mount Wilson 100-inch reflector. The mounting of the 200-inch Hale telescope is a variation of this, the upper bearing being greatly en-

larged into a horseshoe so the telescope can be pointed at the pole of the celestial sphere.

Model V is a forked mounting like Model III. Indeed, the latter would assume this position of axes if it were to be used at the poles (or at the equator, with a nominal interchange of axis nomenclature). For those who are not concerned about mounting their instruments equatorially, this altazimuth mounting is the best from the standpoint of simplicity and convenience of operation at low powers.

In VI we see the equatorial coude, or elbowed equatorial. It is in some respects similar to the well-known Springfield mounting, in that the observer sits under cover, always looking down through a stationary eyepiece at an angle equal to the observer's latitude. The box at the end contains a 45-degree mirror that is controlled from the eyepiece. In the box joining the two tubes (one of which forms the polar axis) another mirror is placed at 45 degrees, thus providing the double reflection. The lens, or objective, is located in the square box (shown with a round hole) at the very end of the instrument. The equatorial coude is shown in Young's *Manual of Astronomy* (1902), where it is mentioned that instruments of this kind were in use at the Paris Observatory, one of 24-inch aperture.

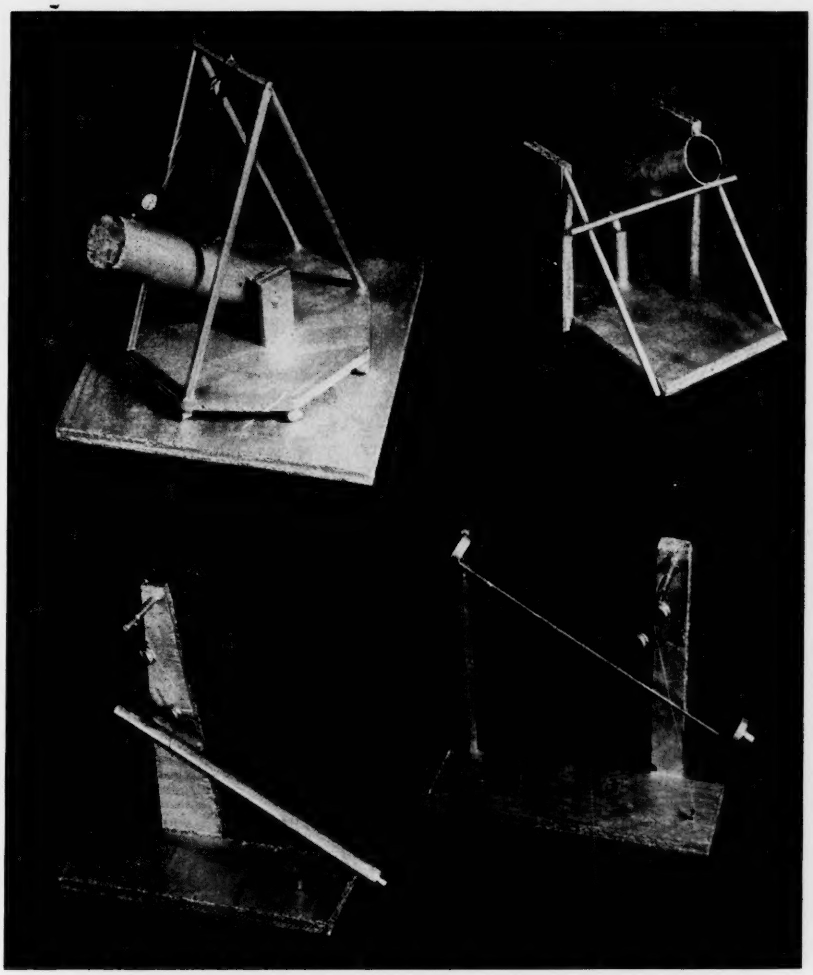
The telescope in VII is stationary, and the rays of an object are brought to it by means of a siderostat. This is, of course, one method of solar observation used to this day. Young's *Manual of Astronomy* (1902) mentions a 48-inch refractor exhibited at the Paris Exposition that was mounted in this manner. The Snow telescope at Mount Wilson and the 15-inch refractor at the Cook Observatory in Upper Darby, Pa., are mounted horizontally and use a siderostat. A disadvantage of this method is that the field of view rotates with the siderostat mirror, and when photographs are taken the plateholder must be counterrotated in order to prevent trailing of the images.

The mounting used by Sir William Herschel for his four-foot reflector is shown by VIII (second picture). This instrument was of the direct-vision type (frequently referred to as the Herschelian reflector), that is to say, the observer stood with his back to the object, and a platform that could be moved by means of a block-and-tackle arrangement supported him. This is really an altazimuth mounting, and the observer must have had quite a time in trying to locate an object with such unmanageable means. A woodcut of the original is shown in Thompson's *Making Your Own Telescope*, page 16. The large base plate, which, to judge from the picture, was all of 20 feet in diameter, rotated on rollers equally spaced around the periphery. No doubt the use of this instrument required an assistant, as there was a gear and handcrank arrangement quite out of reach of the observer on the platform.

Lord Rosse, with the six-foot Parsonstown reflector, which also was a direct-vision instrument, solved the problem of mounting such a large tube as shown by IX. The model shows that this instrument could command only a strip of sky to either side of the meridian, and could not reach the zenith at all. The lower end was set in a sort of ball-and-socket joint, and the upper end rested on a support whose position, as well as the position of the tube lengthwise of this supporting bar, was adjusted with a block-and-tackle arrangement.

The last two models show methods used at the time of Huygens for managing the long refractors of that day (example: 6-inch aperture, length 90 feet). It will be recalled that such long instruments were the fashion before the days of the discovery of the achromatizing principle. Model X shows again a ball-and-socket joint near the eye end of the telescope, the position of the instrument being controlled by the ubiquitous block and tackle. In XI the tube was dispensed with, and object glass and eye end were joined by a rod.

The models were made of plywood and dowel rod of various sizes. Each was finished with aluminum paint, which helps them photograph well. Some were designed with the aid of illustrations, but without particular adherence to close detail. About half of them were made "out of my head," simply as a result of long acquaintance with them. They were all made to be movable, with the exception of Model IX.



The author built these models to show now outdated methods for mounting reflectors (VIII and IX at the top) and refractors of great focal lengths (X and XI at the bottom).

NEWS NOTES

By Dorrit Hoffleit

ANOTHER SUPERNOVA RADIO STAR

Tycho's nova of 1572 has been tentatively identified as the source of radio radiation at 158.5 megacycles per second observed recently at the Jodrell Bank Experimental Station, Cheshire, England, by R. Hanbury Brown and C. Hazard. They discuss the problem in *Nature* for August 30th. The 1950 position of the new radio source is $0^h\ 21^m\ 49^s$, $+64°\ 15'$, which compares well with the position of Tycho's star at $0^h\ 22^m\ 0^s.2$, $+63°\ 52'.2$. The chief difficulty in observing the new source is its proximity to another intense radio star known as Cassiopeia I, which may account for its not having been observed before.

The intensity of this radio star is less than 1/10 that of the radio source that has previously been identified with the Crab nebula. This is also the difference in brightness of the two supernovae at their respective maxima (about -4.0 for Tycho's star, -6.5 to -7.0 for the Crab nebula). Their present integrated photographic magnitudes must differ by over six magnitudes; in fact, no visible remnant of Tycho's nova has even been observed.

The discovery of this new radio source supports the conclusion previously based only on the Crab nebula identification, "that the remnant of a supernova is a source of intense radio-frequency radiation. This phenomenon is of great interest since no satisfactory mechanism for the generation of the radiation has yet been proposed," the investigators state.

BAYS IN HOLLAND

The origin of the Carolina Bays has been a controversial subject ever since they were first photographically mapped by Melton and Schreiner in 1933. The meteoritic theory, much as it has captivated the imagination, seems to be losing favor. These formations were recalled at meetings of the International Society of Photogrammetry which were held in Washington in September. Colonel C. A. J. von Freitag Drabbe, of the Netherlands Topographic Service, presented a monograph, *Aerial Photograph and Photo Interpretation,* in which he showed that closely similar formations abound in the Netherlands. There, however, their discovery is difficult because of the overlying civilization, whereas the Carolina Bays are in practically virgin condition.

Von Drabbe thinks both groups of oval depressions are glacial phenomena produced by the melting of glacial ice. Some of the ovals may have been formed when already buried glacial ice (ice fossils) melted and the overlying layers of sediment collapsed. Bringing together many geological factors, he presents very convincing evidence in support of his theory. In particular, he calls attention to rocks in the vicinity of the Dutch craters. No natural rock formations of the sort exist in the Netherlands, but similar boulders are found strewn along the Baltic. The origin of such boulders seems to be in the mountains of Finland and Scandinavia, whence glaciers carried them southward.

As aerial observations become more common it will be of great interest to search other areas near the boundaries of glacial migrations, especially soft-soil regions, for further confirmation of this theory.

MURGAB METEORITE CRATERS

Via the *Irish Astronomical Journal* we learn of the existence of two meteorite craters in the East Pamir highlands (just north of India in Tadzhik S.S.R.), reported in the *Astronomical Circular* of the Russian Academy of Sciences, Jan. 7, 1952. The larger crater, 260 feet in diameter and about 50 feet deep, was found and first described by H. D. Klavins in 1926. A special expedition in 1951, led by S. A. Zaharov and A. M. Baharev, found a second crater, 52 feet in diameter, and 820 feet from the principal one. These lie in an almost uninhabited region 12,100 feet above sea level, at longitude 74° 16′ 50″ east, latitude 38° 5′ 45″ north.

Meteoritic origin appears definite on the basis of rock debris and a surface of burned limestone covered with a ferrous layer two to five millimeters thick. Kirghiz nomads of the region relate that a fiery star fell there 200 or 300 years ago, and the site of the craters is named Chaglgan Toushtou, meaning "the place where lightning fell."

IN THE CURRENT JOURNALS

THE WONDER STAR: ETA CARINAE, by Gerard de Vaucouleurs, **Leaflet** No. 281, Astronomical Society of the Pacific, September, 1952. "Eta Carinae has been so quiescent since the end of the nineteenth century that even the most assiduous observers lost interest. . . ."

THE STRUCTURE OF THE GALAXY (Recent Advances in Science, Astronomy), by Michael W. Ovenden, **Science Progress**, July, 1952. ". . . we are very much in the position in our own galaxy of being unable to see the wood for the trees, and in many ways we have learnt more about it from the investigation of other nearby systems than by direct observation of stellar distribution."

JOHN H. PITMAN DIES

One of the country's best teachers of astronomy, Prof. John Hines Pitman, died at Swarthmore, Pa., on September 23, 1952, at the age of 62. He had been associated with the Sproul Observatory of Swarthmore College almost from its beginning.

Professor Pitman received his A.B. and M.A. degrees at Swarthmore, then spent two years at Lick Observatory, after which he returned to his alma mater as teacher and research worker. There he became associate professor of astronomy, teaching both mathematics and astronomy. In 1941, he was made chairman of the teachers' committee of the American Astronomical Society.

Together with Dr. John A. Miller, he began the astrometric work for which Sproul Observatory has become renowned, and he took part in this work for nearly four decades. His principal published contributions were in the field of parallaxes and mass ratios.

Professor Pitman was very active in community affairs, serving as burgess of the borough of Swarthmore from 1934 to 1947.

D. H. MENZEL BECOMES HARVARD ACTING DIRECTOR

Effective this fall, Dr. Donald H. Menzel has been appointed acting director of Harvard College Observatory, to fill the vacancy caused by the retirement of Dr. Harlow Shapley (*Sky and Telescope,* December, 1951, page 31).

Associated with Harvard since 1932, Dr. Menzel has been a full professor since 1938. He was chairman of the department of astronomy from 1946 to 1949, has been associate director for solar research at the observatory since 1946, and director of the observatory's Sacramento Peak station at High Rolls, N. M., since 1951. He is author of *Our Sun.*

Dr. Menzel has participated in four eclipse expeditions, to observe the total eclipses of 1930, 1932, 1936, and 1945.

CONFERENCE ON ABUNDANCE OF THE ELEMENTS

The National Science Foundation is sponsoring a basic research conference on the abundance of the elements at Yerkes Observatory, Williams Bay, Wis., on November 6-8, in co-operation with the University of Chicago. Some 40 outstanding astronomers, chemists, geochemists, and physicists have been invited from university, industrial, and government research organizations by a committee consisting of Harold C. Urey, chairman, University of Chicago; Alfred O. Nier, University of Minnesota; William W. Rubey, U. S. Geological Survey; and Otto Struve, University of California.

A general view of the En Nahud station. On the left is the tent with radios and chronographs; in the center, the cinema pier, with the sun screen beyond; on the right are the photoheliograph and coelostat.

GREENWICH ECLIPSE EXPEDITION

BY R. D'E. ATKINSON, *Royal Greenwich Observatory*

THE PROGRAM of the Royal Observatory, Greenwich, at the eclipse of February 25, 1952, provided for two stations in the Sudan and two in the Persian Gulf area; their purpose was to use the cinema method of the author, which had been successfully tried out at Mombasa in 1948, first to obtain corrections to the moon's place, and second (by combining results from different stations) to infer geodetic relationships. In addition, since the method has been found to demand a good knowledge of the moon's limb at the particular librations involved, it was planned for the Sudan stations to obtain some relatively large-scale pictures of the moon, as silhouetted against the sun during the actual eclipse.

For the Atkinson method, the stations must be somewhat outside the track of totality (or annularity), and for geodetic results they should be as far apart along the path as possible. Weather conditions west of the Sudan and political conditions east of the Persian Gulf combined to restrict the available length of track in this case. It was decided that the most westerly station should be as far west as could reasonably be reached from Khartoum, and north of the track, as there was risk of cloud to the south of this region. A site was selected 25 miles beyond En Nahud, on the Darfur "road," and the 180-mile truck journey from the railhead at El Obeid proved fairly strenuous, as had been expected. The second Sudan station, south of the track, was located at Tendelti, on the railway. The other two stations, also one each side of the path, were at Batha in Iraq, and near Al Jahara in Kuwait; these stations did not undertake large-scale pictures, as the difference in libration, compared with the view from the Sudan, was not serious.

The main task at all four stations was exactly the same as it had been at Mombasa, namely to make a timed cinema record of the rapid change in position angle of the thin solar crescent which remained visible even at mid-eclipse. The position angle of the line of cusps can of course be predicted for any given time, and the mean difference between the predicted and observed times, for any given set of position angles, provides a correction to one co-ordinate of the moon's place, while the difference between the predicted and observed rates of change gives a correction to the other. The method allows both to be obtained with comparable accuracy, using position angle measurements only, and as the rate of rotation is rapid the accuracy to be expected is high. The geodetic advantage of obtaining two coordinates per station is of course considerable.

The apparatus consists of an ordinary 35-mm. movie camera, with a good telescope objective of about one meter focal length used instead of the camera lens. A green filter is used to cut out the secondary spectrum, and this results in very sharp images. An unsilvered glass mirror is placed in front of the lens, and the assembly is fixed in such an azimuth

J. D. Pope adjusts the coelostat mirror at the Iraq station. The sun screens are removed to give a clear view, and the theodolite is also shown, in the position used for checking azimuth and level. The box on the pier contains the chronometer.

that after reflection in this mirror the image at the time of eclipse will travel horizontally across the frame (or nearly so), owing to the sun's diurnal motion. The exact direction of the diurnal motion thus recorded provides a datum for calibrating the position angles on individual pictures, and there is no need to rely on any angles determined in the field. The front of the camera can be left uncovered, and the crescent image can thus be seen on it and adjusted by moving the mirror. The observer has simply to set the image so that a few minutes before the start of the run it is moving along a horizontal line already drawn on the camera front, and passing each of a set of half-minute marks at the appropriate half minutes.

When he is satisfied, the observer clamps the mirror, inserts the green filter, and waits for switch-on time; the image will by then be fully on. The camera speed can be adjusted so that a 200-foot roll of film will just be exhausted by the time the image reaches the other end of the frame — after three to four minutes. Three small dots are contact-printed on every frame, at the time of exposure itself, to act as fiducial marks and to check on possible differential shrinkage of the film. The instants of exposure are obtained from a direct contact on the axis of the rotating shutter, connected to one pen of a two-pen tape chronograph running at 10 centimeters a second, the other pen being connected to a contact chronometer. Immediately before and after the run the same chronograph is used to compare the chronometer directly with the special eclipse signal, which in this case was broadcast from Rugby continuously from 08:00 to 10:20 UT on two frequencies, and served for all four stations.

The large-scale pictures were obtained with a photoheliograph, using 5½-inch "topographic base" film and fed by a coelostat. If pictures are taken at stations on both sides of the track, for about 20 minutes before and 20 minutes after the cinema run, the entire limb of the moon can be covered, with good overlaps. In order to eliminate the rather large changes of camera azimuth which would otherwise occur in 45 minutes as a result of the moon's changing declination, the coelostats were set off, in azimuth and elevation, so that their axes pointed toward the pole of the fictitious "diurnal circle" which osculated the apparent diurnal path of the moon at the time and place in question. The coelostat speeds were also adjusted, soon after first contact, to suit the moon. These precautions worked very satisfactorily in practice, at both stations. A pair of pictures was taken at each station about every two minutes, and the observer had plenty of time for minor adjustments of position, checking the chronograph behavior, covering and uncovering the coelostat if desired, and attending to any miscellaneous details. The cinema observer was entirely unoccupied during most of this program, except for rating the chronometer in the intervals between the photoheliograph exposures, which, when they came, were all also recorded on the chronograph; about eight minutes before mid-eclipse, he dropped this work and concentrated on setting the crescent correctly on the cine camera, and starting its run.

The two programs in fact dovetail so well that two men per station are amply sufficient; indeed, in the event of sickness or accident one man could in principle carry out almost the entire double program singlehanded. At stations where only the cinema program is involved, one man is evidently enough; but of course it would be rash to plan for a station with one man only.

It was, however, out of the question to detach eight men from Greenwich. Fortunately, the Royal Observatory, Helwan, expressed interest in the Sudan observations, and co-operation was arranged and carried through in full in spite of the difficult political situation at the time. Two observers were sent from Helwan to Tendelti, and one to En Nahud, and Helwan also supplied most of the camp equipment (including very large double-roofed tents), as well as jeep trucks and drivers for local transport. They bore a very substantial share of the financial burden, and they furnished the cooks and camp servants. The En Nahud station, shown in the illustration, was two hours each way by jeep from water, even washing water, and there was no truck which could have been hired at En Nahud. There is no question that the co-operation of Helwan enabled a more ambitious program to be carried out than would otherwise have been practicable.

The two Persian Gulf stations were the guests of the Iraq Petroleum Company and the Kuwait Oil Company, respectively, who supplied complete camp equipment, as well as servants and food, carried out all "local works," and took care of dock and land transport operations; they also supplied each station with one skilled assistant. The two stations, and the Royal Observatory, owe them a great debt of gratitude.

At all four stations, dust was a serious hazard. An actual duststorm made all work impossible while it lasted, and spoiled the sky for about a day after it had stopped. But even at other times, coelostat mechanisms had to be run without lubrication, and dust penetrated into and affected the rates of even boxed chronometers. A further difficulty, at least in the Sudan, was that on all days before the eclipse the seeing was almost uniformly bad, so that accurate focusing was very difficult. In some cases, the ideal focus was not in fact achieved, but in most instances the films obtained will at least be measurable. Only detailed study can show what loss of accuracy has in fact resulted, but it is possible that both cusps of a crescent would be similarly affected and the loss on the cinema films may be slight.

Results were obtained at the three stations which had clear weather (Iraq had cloud), but at both the Sudan stations some trouble was experienced with magazine jamming. This had never occurred during rehearsals, or during tests at home. At Tendelti the 5½-inch magazine jammed, but as the program was intermittent a spare magazine was substituted with hardly any loss. At En Nahud, the cine magazine jammed; by the time the magazine and torn film had been cleared from the camera and a spare magazine substituted, only about one minute of the intended four remained, but this was successfully photographed.

Measurement and analysis will of course occupy some time. Several thousand movie images are involved, and the observed position angles must be compared with detailed predictions based on the best information which may be available about the moon's limb, either from the photoheliograph results or otherwise.

MORRISON PLANETARIUM OPENS

On November 7th, the Alexander F. Morrison Planetarium at Golden Gate Park, San Francisco, will open to the public, after dedication ceremonies to be held the previous day. The new planetarium is equipped with the first complete major projector to be built in the United States, the result of 4½ years of work in the instrument shops of the California Academy of Sciences. Costing $140,000, the projector is housed in a new hall of sciences built at a cost of over a million dollars. The necessary fund was raised through bequests and many private donations, large and small.

The opening demonstration is entitled "Stars over San Francisco," and will run during November. There will be at least three shows each day (closed on Mondays and Tuesdays), at 2:00, 7:00 and 8:30 p.m.

George W. Bunton, associated with the Griffith Planetarium in Los Angeles for 13 years, is manager and lecturer; Leon E. Salanave, formerly an astronomy instructor at Sacramento College, is lecturer and in charge of the academy's astronomy section; and Alvin C. Gundred, who has been concerned with electrical design and construction on the project since its beginning, is the planetarium technician. The operating staff is under the general supervision of Dr. Robert C. Miller, director of the California Academy of Sciences.

American Astronomers Report

Here are highlights of some papers presented at the 87th meeting of the American Astronomical Society at Victoria, B. C., in June. Complete abstracts will appear in the Astronomical Journal.

A Massive Binary

An eclipsing variable which shows continuous variation of light proves to be an exceptionally massive and luminous system, according to spectrographic investigations by Dr. Joseph A. Pearce, director emeritus of the Dominion Astrophysical Observatory.

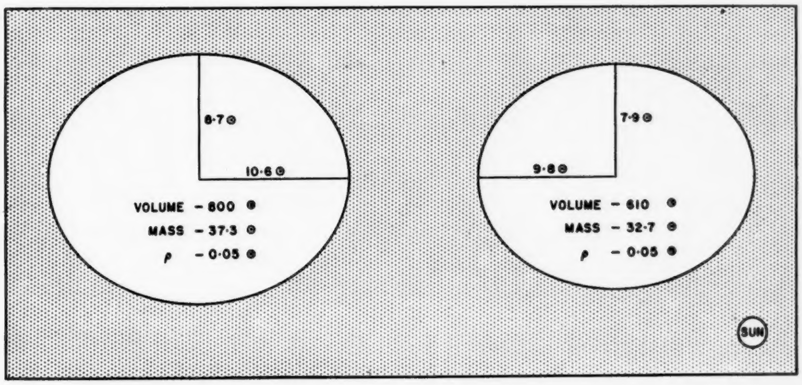
The binary, V382 Cygni, discovered by A. A. Petrov in 1946, varies from 9.04 to 9.94 magnitude in 1.8855 days. Twice during the period over half the light is lost, a puzzling situation without spectrographic information.

Using a one-prism spectrograph attached to the 73-inch reflector, Dr. Pearce found that the stars, both of type *O7*, have relative orbital velocities of 710 kilometers per second, the largest value thus far discovered.

The masses are 37 and 33 times the sun's, respectively. The primary star is about 35,000 times as bright as the sun; the other 26,000 times as bright. Both the hot, blue-white stars have surface temperatures of 33,000° centigrade. The brighter star has a volume nearly 800 times that of the sun, while the other is 610 times the sun's volume.

The separation of the centers of the two stars is 11½ million miles. Because of their proximity, gravitational forces between these massive stars produce huge tidal bulges, narrowing the separation of the surfaces. When the system is at maximum light, the elongated sides of both stars face the sun. During eclipse, not only is one star obscured, but the other is seen end-on, thus explaining the greater than 50-per-cent cut in light. The orbit of the system lies nearly in our line of sight.

The longest axis of the larger component is about nine million miles in length, with the other dimensions about 7½ million miles. The fainter star is only slightly smaller. Both stars are about 1/20 as dense as the sun.



The relative sizes, shapes, and other characteristics of the components of the double star V382 Cygni, as determined by Dr. Joseph A. Pearce. The sun is shown on the same scale. Dominion Astrophysical Observatory diagram.

Mapping the Sun's Magnetic Field

The intensity and polarity of the magnetic field at any point on the disk of the sun can now be immediately determined with apparatus developed by Drs. Harold D. and Horace W. Babcock, Mount Wilson and Palomar Observatories. By a scanning procedure, it is practicable to produce a map of magnetic activity over the whole disk in about one hour.

Two instrumental advances that make this operation possible are the use of a large plane grating of higher quality than has been available heretofore, and an electronic difference detector using two balanced photomultipliers behind a double exit slit, the two slits being located on either side of the spectral line center where the profile is steepest. In other respects, the analyzer in front of the entrance slit consists fundamentally of a quarter-wave plate, a half-wave plate rotated at constant speed, and a Nicol prism. With the double detector and difference amplifier, any slight general intensity modulation of the whole spectrum caused by extraneous effects such as partial polarization by the coelostat mirror becomes negligible.

The new grating, used in the 75-foot spectrograph at the Hale Observatory in Pasadena, has a ruled area of eight by five inches, with 15,000 grooves per inch. It is blazed to concentrate the light in the fifth-order spectrum, where the dispersion is one angstrom per 11 millimeters and the resolving power is 600,000. Scattered light and ghosts are negligible.

A direct-coupled cathode-ray tube and a camera are used in recording. The moving electron beam of the cathode-ray tube draws simultaneously a horizontal straight reference line and a fluctuating signal line. The deviation of the latter is a measure of the component of the magnetic field in the line of sight. The scale is such that a deflection equal to the interval between fiducial traces is equivalent to about 40 gauss, with deflections of 10 gauss usually distinguishable from the noise of the system. A much smaller field is detectable when the scanning is omitted and the apparatus is concentrated on any particular point of the sun's surface. Upward deflections indicate positive (north-seeking) polarity; downward deflections are negative. During scanning of the disk, the Doppler shift resulting from the sun's rotation is always compensated by the tilt of a plane-parallel plate in front of the exit slit.

Nearly all the observing up until June had been done with the line of neutral iron at 5250.3 angstroms, which has the sensitive pattern of a Zeeman triplet three times as wide as normal. Control traces have been made occasionally with the line at 5123.8, also of neutral iron, which has no Zeeman splitting at all.

Successive maps of the same kind, repeated at intervals of an hour or a day, show as readily recognizable features the persistent fields of magnetic activity associated with sunspots, spot groups, and incipient spot areas.

Dwarf Percentages

Spectral surveys in the Milky Way, carried on by Dr. S. W. McCuskey, Warner and Swasey Observatory, indicate that 80 to 100 per cent of the stars of spectral types *F8* to *G2*, between photographic magnitudes 8.5 and 11.5, are dwarfs. This is in sharp contrast to previously published percentages, 40 to 60 per cent, found from proper motion data.

Dr. McCuskey's study also showed that the proper motion data of the Yale zone catalogues for magnitude 9.5 is best represented by the higher percentage of dwarfs, in conformity with the results of the spectral survey.

The original discrepancy probably is due to the inclusion of intermediate and late *G* stars with the early *G* group. The percentage of dwarfs diminishes rapidly with advancing spectral type. Both the spectral data and the earlier proper motion studies place the percentage of

dwarfs at 20 to 30 for the $G5$ stars and at five to 10 for the $G8$-$K3$ stars.

Nova Aquilae 1918

The importance of the peculiarities of the spectrum of a nova during minimum as well as maximum light is shown by the analysis of Nova Aquilae 1918 that was presented by Dr. Dean B. McLaughlin, University of Michigan Observatory. He explained the variable profiles of the emission bands in the spectra of this and other novae.

During the secondary oscillations of light that follow a nova's first spectacular outburst (to magnitude −0.7 for Nova Aquilae), the spectral lines at light minima show higher excitation than at light maxima. This is attributed to a higher effective temperature of the photosphere of the central star. At the maxima, the exciting radiation comes from a larger surface of lower temperature, within the secondary cloud close to the star.

The high-frequency radiation from the star is mostly exhausted in this inner cloud, and not much is left for excitation of the distant principal shell of gas that has exploded from the nova. During the maximum stage, emission from the principal shell is mostly confined to an inner layer, and large variations of density in that shell have little effect on the observed band structure. At the light minima, however, the opacity about the star has temporarily cleared away, the small but hot star shines through strongly and excites the principal shell throughout its thickness. Under these conditions, any noticeable variations of density in the principal shell, such as knots of gas, are revealed as maxima in the spectral band pattern.

Dr. Walter Baade, Mount Wilson and Palomar Observatories, had proposed an interpretation of the emission structure of Nova Aquilae in terms of a symmetrical system of rings and two polar caps of gas, with the polar axis making an angle of 16 degrees with the line of sight and lying in position angle 22 degrees. This model fits the different Doppler patterns in spectrograms taken at Lick Observatory with the slit in different position angles, and with Dr. McLaughlin's theory of the spectral differences between maximum and minimum light.

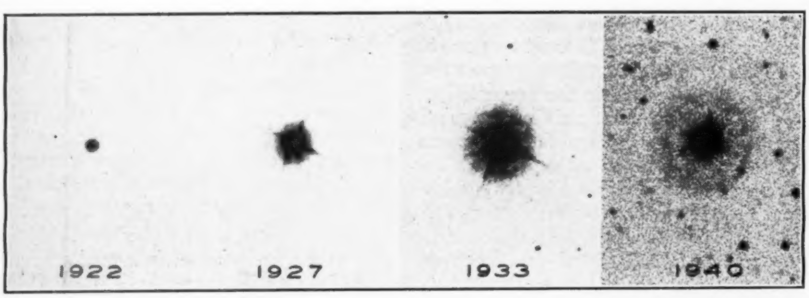
The polar knots were evidently of great density. On direct photographs taken in 1933, Dr. Baade had noticed a small luminous spot on the edge of the overexposed star image (left side), and by 1940 this had become well separated from the image. It is in position angle 28 degrees, agreeing with the Lick spectrogram data. The rest of the expanding shell (or rings) of Nova Aquilae had by then faded almost to the limit of record.

Double Star Evolution

G. J. Odgers and R. Stewart, of the Dominion Astrophysical Observatory and Pacific Naval Laboratory, respectively, have investigated the action of gravitation upon vast bodies of low-density gas and dust as a means of forming double and multiple stars. Double stars are so common in the universe (about one in four) that their existence poses an important problem for which no entirely satisfactory theories have been found.

It is unlikely, for instance, that fission can give rise to a star at all, and the accretion hypothesis runs into the difficulty that there is no correlation between the mass and the period of a binary system. Odgers and Stewart point out that the components of binary stars are in the great majority of cases normal single stars.

There does not seem to be any physical force able to bring enough matter together to form a star except gravitation, and Odgers and Stewart show that masses so formed have stellar dimensions. The density fluctuations in a gaseous medium, consequent on the turbulent character of the motions involved, cannot as such give rise to stars; the very violence of the motions will prevent the matter from coming together sufficiently. But once a star has begun to form, there is a finite probability that it can impose such a pattern of movement on the adjacent material as to give rise to a second stellar mass within its gravitational influence. Thus, under favorable circumstances a binary system would originate, and multiple systems would form with only slightly less probability.



The expanding nebula around Nova Aquilae is shown in this series of Mount Wilson Observatory photographs. The four rays are caused by light diffraction by the secondary mirror supports. Note the knot in the 1933 picture; by 1940 it was clear of the image of the central star.

Carbon Monoxide over Flagstaff

One more link in the chain of evidence that atmospheric carbon monoxide is planet-wide in its distribution has been found by Dr. Arthur Adel, of Arizona State College. In solar-telluric infrared spectra made by him at Flagstaff in the autumn of 1940, with a grating having 2,400 lines per inch, he has identified absorption lines of atmospheric carbon monoxide.

As a guide for identifying the CO lines, Dr. Adel used measurements made at Columbus, Ohio, in 1951, by Shaw, Chapman, Howard, and Oxholm. The work is based on the carbon monoxide fundamental at 4.6 microns.

Carbon monoxide has also been identified in the air over the Jungfraujoch, Switzerland, where Migeotte and Nevin have found the absorption intensity in April, 1951, to be four times as great as that in August, 1950.

THIS MONTH'S MEETINGS

Buffalo, N. Y.: Buffalo Astronomical Association, 8 p.m., Buffalo Museum of Science. Nov. 5, Dr. D. C. Jones, American Optical Company, "Present Trends in Optics."

Cambridge, Mass.: Bond Astronomical Club, 8 p.m., Harvard Observatory. Nov. 6, Dr. D. H. Menzel, Harvard Observatory, "The Mystery of the Flying Saucers."

Cleveland, Ohio: Cleveland Astronomical Society, 8 p.m., Warner and Swasey Observatory. Nov. 14, Dr. Peter van de Kamp, Sproul Observatory, "Stellar Families."

Dallas, Tex.: Texas Astronomical Society, 8 p.m., Dallas Power and Light Co. auditorium. Nov. 24, Ted F. Gangl, "Mother Earth and Simple Astronomy."

Denver, Colo.: Denver Astronomical Society, 8 p.m., Chamberlin Observatory. Nov. 10, Astronautics section program. Nov. 24, Dr. E. A. Fath, Goodsell Observatory (retired), "The Asteroids."

Indianapolis, Ind.: Indiana Astronomical Society, 8 p.m., Chamberlin Observatory. 2, Dr. Harry E. Crull, Butler University, "Why a Planetarium?"

Minneapolis, Minn.: Minneapolis Astronomy Club, 7:30, Science Museum. Nov. 5, member participation night. Nov. 19, A. T. Adams, "The Moon and Its Phases."

New York, N. Y.: Amateur Astronomers Association, 8 p.m., American Museum of Natural History. Nov. 5, Armand N. Spitz, Spitz Laboratories, "The Uses of Planetariums."

(Continued on page 22)

Amateur Astronomers

Western Amateurs Convene at Berkeley

THE University of California, at Berkeley, became a stargazers' mecca when more than 250 western amateur astronomers held their fourth annual convention at the Leuschner Observatory on the campus, August 17-20, 1952. Delegates began arriving and registering on Sunday morning, the 17th, and by the afternoon were on their way to visit the nearly completed Morrison Planetarium in Golden Gate Park, San Francisco. [For a brief report of the opening of this planetarium on November 7th, see page 10 of this issue of *Sky and Telescope*. — ED.]

The convention was formally opened on Monday morning in California Hall; Dean Alva R. Davis and Dr. Sturla Einarsson welcomed the delegates on behalf of the University of California and the Astronomical Society of the Pacific. The principal address was given by Dr. Otto Struve, chairman of the department of astronomy at Berkeley, who spoke on "The Place of the Amateur in Astronomy." Dr. Struve lauded amateur astronomers and said their achievements have contributed much to the advancement of the science.

For three days of morning and afternoon sessions, the delegates listened attentively to 21 papers and addresses on various phases of astronomy — telescope making, mirror testing, observing sunspots, variables, meteorites, and features on the surfaces of Saturn, Mars, the moon, and Jupiter. Between sessions and during intermissions the exhibit rooms, filled with amateur instruments and commercial equipment pertaining to telescope making, were visited. Prizes were donated by some of the exhibitors for the best of various optical instruments made by amateur astronomers.

The annual banquet was held on Monday evening at the Hotel Claremont, in the hills above Berkeley overlooking San Francisco Bay. This was followed by the first star party, on the grounds of the John Muir School nearby.

The weather was perfect for the entire four days and nights; not a cloud or a wisp of fog came in to interfere with excellent seeing, and the many telescopes, most of them homemade, were kept busy until the early morning hours.

On the afternoon of the second day came one of the highlights of the convention, the trip to the cyclotron and the huge bevatron now under construction for the Atomic Energy Commission in the hills back of the campus. On Tuesday evening, Dr. Struve spoke on the subject, "What I Don't Know about Flying Saucers." Following this, another star party was held, this time on the grounds surrounding the Leuschner Observatory.

Wednesday afternoon and evening were devoted to the trip to the university's Lick Observatory, 60 miles southeast of Berkeley, and 4,209 feet above the floor of the Santa Clara Valley. En route the party stopped briefly at the Chabot Observatory in Oakland, home of the convention's host, the Eastbay Astronomical Society. Box lunches were taken up to Lick, and the observatory staff furnished hot coffee. Visitors were shown through the huge dome which will house the new 120-inch reflector, and then inspected the grinding and polishing room, where work will soon begin on the huge piece of glass. The stars were out bright, and the delegates began forming lines to look through the 12-inch and 36-inch refractors, which were placed at their disposal for the entire evening.

It was long after midnight when the first cars started down the mountain to the lights below, marking the end of the 1952 convention of Western Amateur Astronomers. We shall meet again next year in Los Angeles with the Los Angeles Astronomical Society as our hosts.

Frank Kettlewell
Eastbay Astronomical Society

Middle East Convention

THE MIDDLE EAST region of the Astronomical League met in the physics building of Wayne University, Detroit, Mich., on September 5-6, 1952, with the Pontiac-Northwest Detroit Astronomers Association and Detroit Astronomical Society as hosts.

Friday was largely devoted to papers. A solar session featured films and slides shown by Miss E. Ruth Hedeman, of McMath-Hulbert Observatory. "My Five Mirrors," by W. E. Miller, was an account of the amateur telescope maker's nightmare in real life. Imagine breaking five mirrors before completing a telescope! Junior telescope activity was reported by Richard Lubiensky and Michael Szczygical. A planetarium show and solar observing rounded out the afternoon program.

At the convention dinner, Dr. Bertram Donn, of Wayne University, read a paper by John Streeter, of the Fels Planetarium in Philadelphia, on "Flying Saucers." It was followed by a half hour of spirited discussion. The evening lecture on "Marvels of the Milky Way" was given by Dr. Helen Sawyer Hogg, of David Dunlap Observatory, University of Toronto.

Two talks of special interest on Saturday morning were by Ruth Northcott, David Dunlap Observatory, on the "Radial Velocity of Stars," and by Keith Pierce, McMath-Hulbert Observatory, on "Space Travel." Trips to the Cranbrook Institute of Science observatory and to the Michigan State Fair, particularly the astronomical exhibit, were Saturday afternoon highlights. The convention closed Saturday evening with a quiz of a panel of 13 experts; Roy L. Dodd, Milwaukee Astronomical Society, acted as chairman.

At the business session, regional officers elected were: chairman, Edwin F. Bailey, Philadelphia, Pa.; vice-chairman, Dr. George Carhart, Pontiac, Mich.; secretary, Eleanor Vadala, Philadelphia, Pa.; treasurer, Betty Fazekas, Washington, D. C.

Belva LuCaric
Baden, Pa.

The convention of Western Amateur Astronomers, Berkeley, Calif., August 17-20, 1952. Photo by Robert Weitbrecht.

REPORT FROM ROME

(Continued from page 5)

tronomy. We are convinced that in this effort we shall have the support of all those who treasure the interests of our science.

"Today we are gathered here in Rome, the ancient capital of the Italian people, the land of Leonardo da Vinci, of Galileo, and of many other great scientists, in order to discuss here how to further the cause of international co-operation. We shall take an active part in all of these questions.

"Taking into consideration that many members of the IAU were not satisfied with the actions of the executive committee, and had expressed their ardent desire to participate in a meeting in the Soviet Union, the Academy of Sciences of the U.S.S.R. has instructed the Soviet delegation to invite the IAU to hold its next general assembly in 1955 in the Soviet Union. An official statement will be made at the final session of our meeting."

Although the Russian invitation was thus the first to come to the attention of the general membership, it was not the first to reach President Lindblad. Altogether there were invitations from seven countries: Russia, Great Britain (delivered in the executive committee by Sir Harold Spencer Jones), Eire (delivered first to Dr. Lindblad, and later officially proposed to the entire IAU by Dr. Brück of Dublin), Poland (delivered by Professor Rybka in the Polish language, at the last general session), Argentina (delivered by Professor Gratton), Belgium (delivered by Dr. Bourgeois with the stipulation that it should not be considered objectionable by any of the other inviting delegations), and Norway (a tentative invitation by Professor Rosseland).

There were long discussions in the executive committee. The Soviet delegation withdrew its own invitation in favor of Poland (and so informed the general assembly during the final session); Great Britain just withdrew — not in favor of any particular country. Belgium was declared unacceptable by the Soviet delegate and was thus eliminated. Argentina was not considered suitable at this time. The invitation from Norway, attractive as it might have been, was not definite enough to permit immediate acceptance. This left Poland and Eire. Dr. Ambarzumian stated emphatically that he could not agree to Eire and that "the Soviet delegation insists upon the acceptance of the Polish invitation."

G. P. Kuiper, U.S.A. (right), discusses astrophysical problems with two members of the Russian delegation, Mrs. A. Masevich and A. Severny.

Finally, in a brilliant speech the general secretary, Dr. B. Stroemgren, proposed that the question be resolved by a secret vote — one vote for each country whose subscription has been paid up. This vote was taken at the final session: 21 countries voted for Eire, five for Poland, two abstained.

It is unavoidable that the political and ideological differences which divide the world today should affect the work of the IAU. These differences are not merely superficial variants of opinion, such as we encounter normally among persons of similar backgrounds and upbringing. The differences that divide the East from the West are of a more fundamental nature, and they have had time, through two generations, to assume a rigidity that cannot be easily overcome. We must expect that these same difficulties will continue to harass the IAU, and to ignore them or to gloss them over would do much harm.

There is every reason to believe that the astronomers of the Soviet Union, and of other countries allied with it, recognize these difficulties as we do, and are trying to cope with them in a spirit of friendly co-operation. It is true that to us, in the western world, the frequent occurrence of abusive language directed against us (see my note in *Science* for August 22, 1952, page 206) is incompatible with the expressions of friendship which we encounter when we meet face-to-face with the Soviet astronomers. Yet, we should perhaps take at face value Dr. Ambarzumian's words at the symposium on stellar evolution:

"In establishing the [astronomical] relationships which have been demonstrated, we have made use of the vast amount of factual material which has been collected at the observatories of the entire world, and also of the theoretical investigations of the scientists of all nations. We attach the greatest possible significance to the peaceful collaboration of the astronomers of the entire world. With complete respect for the achievements of all true workers in science, we believe that our common effort to solve the problems of science, including that of the evolution of celestial bodies, will aid in bringing about a better understanding among the nations of the earth. This is our modest contribution to the noble effort in the cause of peace in the world."

(To be concluded)

A group comprised principally of members of Commi lands (sitting), is president. Kneeling is J. S. Hall, U Kuiper, U.S.A.; E. Schatzmann, France; I. S. Bowen many; C. Shalen, Sweden; (unidentified); V. A. Amba fied); and

OPENING ADDRESS — IAU ROME MEETING

(Continued from page 2)

physics of the sun, have had a great influence. With Schiaparelli, director of the Brera Observatory in Milan from 1862 to 1910, we are approaching our own time. During the opposition of Mars in 1877 he observed the surface markings which he provisionally named **canali.** His work on the periods of cosmic meteors and the connection between comet orbits and meteors is classical. . . .

I cannot venture to bring this historical review up to date. In modern times the contributions of Italian astronomers to our science are so rich that even an attempt at description would take a long time. Very important contributions have been made to the classical parts of our science, as well as to modern astrophysics, solar physics, and sidereal astronomy. We know the important Italian institutions with great traditions, the observatory

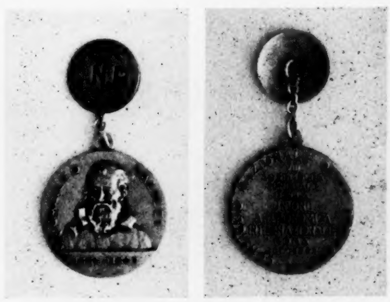
s of Commission 34, Interstellar Matter and Galactic Nebulae. H. C. van de Hulst, Nether-
. S. Hall, U.S.A. Standing, left to right, are J. Dufay, France; T. L. Page, D. H. Menzel, G. P.
. S. Bowen, U.S.A.; P ten Bruggencate, Germany; W. Baade, U.S.A.; E. Schoenberg, Ger-
V. A. Ambarzumian, U.S.S.R.; H. Zanstra, Netherlands; E. Kharadse, U.S.S.R.; (unidentified); and D. Chalonge, France. Photograph by Otto Struve.

Arcetri-Firenze, the Specola Vaticana, re-erected at Castel Gandolfo, the observatory and astronomical museum on Monte Mario in Rome, the Brera Observatory in Milan with the station at Merate, the observatory at Padua with a station at Asiago, the Observatory of Bologna with a station at Loiano, the Observatory Capodimonte at Naples, the astronomical station Carloforte, the observatories Collurania-Teramo, Pino Torinese, Trieste, Catania, and Palermo. At last we should mention the important society, Societa Astronomica Italiana, which is a continuation of the Societa degli Spettroscopisti Italiani, which has played such a great part in the pioneer work in spectroscopy. . . .

F. J. M. Stratton, England, former general secretary, and two members of the Japanese delegation, Y. Hagihara and Z. Suemoto.

Already 30 years have passed since the foundation of our union. There has been no epoch in the history of mankind at which such a great progress in science has been made during such a short time. The immense advances in physics and astronomy have been closely connected. The quantum theory of the atom in the 1920's and nuclear physics in the last two decades have given an immense impetus and inspiration to astrophysics. The methods of observation, based on modern electronics, have revolutionized in many respects not only astrophysical research but also many investigations in classical domains, increasing the accuracy of observation and thereby creating the requirements for a refined discussion. We have an example of this in the propositions regarding the definition of time which have been put before the members of the union in the Draft Report. The structure of our galaxy, the distribution and physical properties of external galaxies, stellar evolution, the physics and development of our planetary system are the domains of astronomy in which enormous progress has been made. It is not too much to say that in the last three decades a new world has developed before our startled eyes. The world which we see through the eyes of science is not a static universe, but a world in action where innumerable stellar systems in rapid internal motion change their shapes, where stars are born and burn out in a gigantic release of energy. It is true that the time-scale which we use is such that in comparison even the age of Rome is but an instant. Fascinating problems are ahead of us, and the knowledge which we now possess is only a first glimpse of the wonderful mechanism of the universe.

During the time in which our union has been active, we have become thoroughly convinced of the importance of international co-operation in science. It is particularly obvious that in astronomy we need a close collaboration between different countries, and I think it may be said that the International Astronomical Union has proved to be one of the most successful among the now active scientific unions. We think highly of our union and its future is dear to us. As citizens of different nations we have different historical backgrounds and in many cases different ways of thinking on the problems of our time, but under the stars we are all united in a common spirit as citizens of a world of science. It is necessary for the common benefit of mankind that this spirit of a united world should become steadily stronger, and that it should spread ultimately to all the relations between the peoples of the world. I am sure that the present meeting will be a successful one, and that while we pursue in all detail the program of our meeting we shall feel that we are at the same time contributing to the mutual understanding between all peoples and nations. It may seem pretentious to assume that such is the case, but it is our profound belief that it is true. Fundamental science works slowly and patiently to unite the peoples of the world above their narrow national interests and ambitions. . . .



This identification badge was given to the delegates by the host organization, Consiglio Nazionale delle Ricerche.

BOOKS AND THE SKY

BASIC ASTRONOMY

Peter van de Kamp. Random House, New York, 1952. 400 pages. $3.75.

DR. VAN DE KAMP's book is the third in a series by Random House, explaining the sciences to the layman. It is divided into four parts, each consisting of several chapters. After two introductory chapters, describing "Sky and Telescope" and "Matter and Light," there follows a brief account of the solar system (35 pages).

Part Two (120 pages) deals with the mechanics of the motions of the planets and the stars. First, the author describes the apparent motions of the sun, the planets, and the stars, and the determination of stellar distances and motions. The following chapters explain in great detail the relative and absolute motions in double star systems, Kepler's laws of planetary motions, Newton's law of gravitation, and the determination of the masses of celestial bodies, while the concluding chapter deals with the discoveries of unseen planets and stars.

In Part Three (104 pages) the physical and chemical properties of the sun and stars are described. It surveys the nature of light, the laws of radiation, and the composition of starlight, and studies the physical properties of the nearer stars. A chapter on atomic structure and radiation prepares the reader for an analysis of the structure and composition of stellar atmospheres and interiors and explains the current theories on the source of solar and stellar energy.

Part Four (104 pages) deals with the Milky Way system and beyond. The arrangement of the stars in our galactic system determined from star counts and proper motions is discussed, as well as the importance of the globular clusters in outlining the size and shape of the system. This is followed by material on galactic rotation, while the final two chapters are devoted to the study of extragalactic objects and to cosmological theories.

The book is essentially nonmathematical, and should be of special interest to the amateur who wishes to familiarize himself primarily with the mechanics of the motions of the planets and the stars. This topic is discussed in greater detail than one usually finds in the current textbooks, with the result that certain other phases of astronomy have received less coverage than is customary in a book of this type. The chapters on the solar system especially appear much abbreviated, and the discussion of the physical properties of the stars deals entirely with "normal" stars, omitting variable stars.

It is the impression of the reviewer that many of the astronomers of recent times do not receive sufficient credit in the book for their outstanding discoveries or theories, which have contributed so much to our present knowledge. Although in many cases their results have been quoted directly, their names are not mentioned, while those of the earlier periods always are. This gives an impression of arbitrariness which should be corrected in a revised edition.

Although not a textbook, the book can be recommended as supplementary reading in an introductory course in astronomy.

K. Aa. STRAND
Dearborn Observatory

OUT OF THE SKY

H. H. Nininger. University of Denver Press, Denver, 1952. 336 pages. $5.00.

FOR SOME YEARS, workers in meteors and meteorites have been handicapped by a shortage of suitable books. Schiaparelli's **Shooting Stars** (English translation by Wylie and Naiden), although originally published 85 years ago, is still valuable for its discussion of the diurnal and annual variations in the rate of fall of meteors and meteorites, for the formulas for diurnal aberration and zenith attraction, and other information, although much of the material is now obsolete. Later books of value include Flight's **A Chapter in the History of Meteorites,** Farrington's **Meteorites,** Olivier's **Meteors,** Nininger's **Our Stone-Pelted Planet,** Hoffmeister's **Die Meteore** (English translation by Olivier, Smith, and Kitchens), and Watson's **Between the Planets.** In all of these, much of the material is out of date and all, or nearly all, of the books are out of print, although a new edition of Watson is being brought out. The book under review was written in response to an obvious need for up-to-date material in this field.

Opening with a historical introduction, Nininger gives notes on several "typical falls" of meteorites, including among the dated ones the important Tilden, Paragould, Archie, Benld, and Norton County falls. He gives special attention to the Pasamonte, N. M., fall on March 24, 1933, for which he was the chief investigator. He also discusses the important undated falls of Plainview, Tex., and Kiowa County, Kans., for both of which he has done important work, and the great Cape York, Greenland, meteorites.

Special attention is given to Meteor Crater in Arizona, and to the Haviland, Kans., crater, as these are the two on which the author personally has done the most work. He discusses more briefly some other craters, and the controversial Carolina Bays. The newly discovered Chubb crater in northern Quebec is referred to only in a footnote. The suggestion of Boone and Albritton that certain geological features are the scars left by the infall of bodies approaching planetoidal dimensions is discussed.

The author leans toward the meteoritic explanation of the origin of the craters on the moon. After considering several suggestions to explain the origin of tektites, he makes a good case for his own theory that they are fused material ejected above the velocity of escape from the moon when big meteors strike it.

The author discusses the sizes, paths through the atmosphere, velocities, and sounds of meteors. In connection with velocity, he appears to assume that a morning meteor, such as the Paragould

or Pasamonte, would necessarily be retrograde, meet the earth "head on" and enter the atmosphere with a velocity of perhaps 40 miles per second, but calculation has shown that the Paragould meteor was direct, and presumably the Pasamonte was direct also.

The chapters on the composition and structure of meteorites, on the etching of iron meteorites, and on the weathering of meteorites are well written and valuable. Experts have looked for chondrules to tell whether or not a suspected stone is meteoritic, and for the Widmanstaetten figures to tell whether or not a suspected iron is meteoritic. But Nininger brings out that the largest stone meteorite known does not show chondrules, and that many iron meteorites do not show the Widmanstaetten figures. He recommends that scholars give much more attention to the weathering of meteorites, and suggests that when meteorites have been given the study that fossils have now received field men will find meteorites in formations older than the Pleistocene and in considerable numbers.

Various theories for the origin of meteorites are outlined, including the explosion of a planet, the collision of two asteroids, and Lockyer's meteoritic hypothesis. The author favors the suggestion that the structure of both stony and iron meteorites has been altered by relatively close approaches to the sun.

The book shows definitely the slant of the "meteorite" rather than the "meteor" man. A diagram shows lines drawn from various points of observation to locate the end point of the path of a meteor, which is important in recovering meteorites; but the fact that a plot of the observed paths gives the radiant of a fireball, just as a plot of the paths of shower meteors gives the radiant of the shower, is not mentioned. Meteor men need a good radiant, based on all observed paths, and they need a method of reduction which shows up discordant observations, such as "mirror vision." Mirror vision, or reporting the path on the wrong side of the zenith, was encountered by Irish on the Amana meteor of 1875, and by Nininger on the Archie meteor of 1932 without being recognized, and mirror vision paths have been found by the reviewer for practically every bright meteor he has investigated. Nininger accepts as real the "swish" heard simultaneously with the fall of meteors at distances of 100 miles or more. The reviewer has received many such stories. Some are very positive statements from observers of meteors which fell years ago. Some are secondhand stories which are denied by the observer himself. None are positive statements by an observer interviewed within a few weeks of the fall of the meteor.

To show why meteor men need personal interviews for accurate work, consider Nininger's "eye-witness accounts as reported by Farrington and Crooks" for the Tilden meteor of July, 1927, in Illinois.

It is stated that Raney, who was cutting grass, saw something strike the ground, went to the spot, and found a hole nine inches deep, in which was meteorite No. 1. It is stated that five men were starting to plow on the Dunn farm when they saw faint smoke, then dust thrown up. After a few minutes they dug up meteorite No. 2. It is stated that the Mansker family heard a sound like an airplane crashing to earth. At the end of a two-day search, Mansker found a hole in which was meteorite No. 3.

Interviews on the spot, however, with Raney, Dunn, Hirte, Mansker, and others, including witnesses of the meteor at distances of more than 100 miles, and photographs and measures of the holes had revealed the following: Raney and neighbors were sitting in their yards after the noon meal when they heard the detonations, followed by a sound resembling the hum of an airplane, and then by a sound as though a dud shell were falling. Looking in the direction of the "dud shell" they glimpsed momentarily a "dark streak like smoke." Going in the direction of this streak, they converged in the back yard of a Mr. Stone and saw a meteorite. Raney got his hands on it first and lifted it out of the shallow hole, which measured five inches deep.

Two young men were putting up hay on the Dunn farm when they heard the detonations and other noises ending with a swish as though something were falling. Looking in that direction, they saw dust fly, but were afraid and took a load of hay in without going over to the spot. Returning to the field, however, they decided to investigate and found a meteorite.

Mr. Mansker, out in his yard after the noon meal, heard a hum which grew louder, ending in a thud as of a heavy body striking, and, almost simultaneously, a blast like a dynamite explosion. Mansker made no investigation of the sounds, however. Three weeks later the reviewer, investigating the fall, found that men at a country club adjoining the Mansker farm had heard a sound like an airplane going over and landing on the Mansker farm. He therefore called on Mr. Mansker and found him cultivating corn near the spot where the "airplane" had seemed to land. He asked Mr. Mansker to be on the lookout for a hole containing a meteorite, probably larger than those already found. A little later that same afternoon, Mr. Mansker, as he was cultivating, found the hole containing a 110-pound meteorite.

The book closes with a chapter on a "Proposed National Institute of Meteoritics." The author made a similar proposal at a meeting of the American Association for the Advancement of Science in 1935. He suggests that such an institute should bring about the recovery of perhaps 10 meteorites per year, instead of one or two, within the bounds of the United States. The reviewer agrees that there should be about that increase in the number of recoveries of meteorites, and for all these there could be better data on the path through the atmosphere, the resistance of the air, and the orbit about the sun, than for any meteors dropping meteorites to date. Some years ago, the reviewer suggested that the U. S. Geological Survey could take over such work on meteors and meteorites on a national scale perhaps with less additional help than any other organization, since the survey already has field men working in all parts of the country.

The reviewer plans to use this book in his own college course on meteors and meteorites, but he will supplement it by giving the students the original measures on certain spectacular meteors, and let the students solve for paths through the atmosphere and orbits about the sun from this fundamental data. Perhaps Dr. Nininger could furnish college teachers with his measures on certain meteors, so that they could give their students similar laboratory work based on his data.

C. C. WYLIE
State University of Iowa

GENERAL ASTRONOMY

Sir Harold Spencer Jones. Longmans, Green and Co., New York, 3rd edition, 1951. 456 pages. $5.75.

IN 1922 when the first edition of **General Astronomy** appeared, the nature of the spiral nebulae had not been settled, and in this first edition it was stated that "although the balance of evidence at present seems opposed to the island universe theory, the question cannot be regarded as yet definitely closed." In the intervening three decades, not only has this question been put on a totally different footing but so also have the questions of stellar energy, stellar evolution, and the structure of our own galaxy. Progress in

astronomy demands, therefore, that from time to time textbooks be revised.

One expects that those parts of a field that have progressed the most will be accorded the most attention in a revision. It is quite disconcerting, therefore, to find that in his third edition of **General Astronomy,** long a standard and classically reliable textbook, the Astronomer Royal gives word for word and diagram for diagram the same material on Beta Lyrae which was presented in the 1922 edition, thus ignoring in this specific example one of the most outstanding advances in our knowledge of the physical processes in the stars, and one of the few observational evidences we have for stellar evolution taking place before our eyes.

In the matter of astronomical instrumentation one finds the same fine treatment of the filar micrometer, the transit instrument, and even the heliometer (indeed, this is one of the few texts in which there is a treatment of this classical instrument), but the 200-inch Palomar telescope enters the revision almost as an interloper. And again, in the chapter, "Astronomical Observations," we find that the author really does mean astronomical and not astrophysical.

The second edition of this book appeared in 1934. The format is the same in all three editions, the chapter headings almost identical and almost every paragraph starts with the same words. There have been added only three or four new illustrations in the entire book. Even in the "classical" section, the student might arrive at the erroneous idea that no progress has been made. We find the same old cuts of ancient-looking transit instruments and chronographs, but no illustrations of modern innovations in the obtaining of stellar positions such as the zenith tube and the zenith camera.

The photographs of Mars, taken in 1909, those of Jupiter, taken in 1891, a diagram of the eclipse of 1919 and a drawing of the solar corona of 1886, spectroheliograms taken in 1910, and a prominence of 1919 have been used in all three editions. While there is a timeless quality about astronomical phenomena, textbook writers should not allow the student to regard astronomy as a dead and ancient science. Even if better photographs of the solar corona had not been taken since 1886 (but, of course, they certainly have!) there would still be strong argument for including equivalent recent photographs.

The classical and the positional parts of the book remain the same fine and more-than-adequate treatments they have always been, and the strength of this textbook is that it does present a basic and thorough introduction to what might be called standard astronomy. Perhaps only here can the student find the means for appreciating the basic problems of astronomy (as contrasted to astrophysics) such as the parallax of the sun, the geometrical aspects of the solar system, and the motion of the moon. Where else in modern textbooks does one find a treatment of the evection, the annual equation and the variation? It is entirely excusable in these sections to find that they have been taken over almost without revision from the earlier editions. We do find, however, new values in the fourth and fifth decimal places for the tropical, sidereal, and anomalistic years.

The first three chapters, "The Celestial Sphere," "The Earth," "The Earth in Relation to the Sun," are identical in all three editions. They represent a good down-to-earth, though somewhat pedantic introduction to that phase of astronomy. The book suffers as a textbook, however, in the absence of questions and problems at the end of each chapter.

Despite these obvious shortcomings, this book can be conscientiously recommended as a very good reference, at the student level, for those many phases of astronomy which are so frequently neglected in modern textbooks, particularly those published in the United States, where the emphasis has too often been on making material palatable and sugar-coated. This has meant that many dry "bedrock" phases of astronomy are never brought into the sphere of awareness of the student.

The opportunity afforded the writer in the preparation of this review has caused him also to wonder whether the time has come for the wider use of collaboration of two or three authors in the writing of serious and comprehensive textbooks. The burden of representing fairly the theoretical, the classical, the instrumental, and the astrophysical aspects of astronomy is perhaps too much for one author. There is perhaps no one better qualified than the Astronomer Royal at the present time to introduce the student to the geometrical and dynamical aspects of astronomy. It is apparent, however, that had this textbook been done in collaboration with a practicing astrophysicist the student, for whom textbooks are written, would be the primary beneficiary.

J. ALLEN HYNEK
Ohio State University

NEW BOOKS RECEIVED

RADIO ASTRONOMY, *Lovell and Clegg*, 1952, *Wiley*. 238 pages. $4.00.

This semipopular account of the new field of radio astronomy was noted in this column in May, 1952, and was reviewed in July, 1952. The book is available in the United States from John Wiley and Sons, Inc., 440 Fourth Ave., New York City.

28 SCIENCE FICTION STORIES, *H. G. Wells*, 1952, *Dover*. 915 pages. $3.95.

Included in this collection are two novels, "Men Like Gods," and "Star Begotten," and 26 short stories.

INSIGHT INTO ASTRONOMY, *Leo Mattersdorf*, 1952, *Lantern Press* and *Sky*. 223 pages. $3.50.

An amateur astronomer of long standing writes for the layman who wants an insight into the entire subject of astronomy, with particular attention to such topics as eclipses, the tides, timekeeping, the seasons.

THE AIR ALMANAC — 1953 JANUARY-APRIL, *H.M. Nautical Almanac Office and U. S. Naval Observatory*, 1952, *H.M. Stationery Office*, London, and *Supt. of Documents*, Washington, D. C. 298 pages. 10s. in U. K. $2.25.

This publication covering the first four months of 1953 is the first appearance of the revised *Air Almanac*, now produced jointly by the nautical almanac offices of the Royal Greenwich Observatory and the U. S. Naval Observatory, for use in the United Kingdom, the United States, and Canada. Changes have necessarily been made in the form and contents, but none to prevent a navigator familiar with either preceding almanac from using this one immediately.

New features include the strip diagrams showing the daily positions of bright stars, planets, and moon; sky diagrams; and some new tables.

THE HEAVENS ARE TELLING

Urana Clarke. Acorn House, New York, 1951. 128 pages. $2.95.

THIS BOOK is written for the amateur astronomer, for the person, young or old, who has looked up at the sky and wondered. The author's beginning sentence, "Astronomy is the most exciting hobby in the world," is both an appropriate introduction and a good summary.

As the title suggests, the book presents the story of what is in the sky. However, this is not the usual presentation of facts about our solar system and the stars. The author's approach is through the questions people ask, and the chapters answer these, starting with the biggest and most inclusive, such as "What Is the Sky?" and "What Is the Universe?" This leads to more familiar objects, the sun, planets, satellites, comets.

In the 38 chapters are discussed the constellations and what stars can be seen on certain evenings, the subjects of tides, eclipses, occultations, variable stars, the Milky Way, to name but a few. The scope of the book is wide—it includes something of the history of astronomy, navigation, weather, astronomical instruments, a guide to the constellations, as well as descriptions of our solar system and galaxy. To cover all these fully would require an encyclopedia. Miss Clarke gives the essentials briefly in simple, nontechnical language. Yet, it is amazing how much information the little book contains.

Perhaps because Miss Clarke's interest in astronomy stemmed from navigation, or perhaps because she found people asking these questions, the practical side of astronomy is given more attention than the advancing fields of modern astronomy. The subjects of the origin of the solar system and of the galaxies, for instance, are only barely mentioned.

The book is small and compact. The printing is clear and there are ample illustrations in blue and white—both reproductions of photographs from leading observatories and illustrative drawings. The good diagrams and descriptions of the constellations should make it possible for everyone to identify stars with their aid.

In spite of an author's careful checking, some errors usually get into print, and this book has its share. Some are slips of the pen; some come from overenthusiastic descriptions; some are from unclear use of terms. Because of the author's zeal to be nontechnical and to describe processes in familiar language, there are, in some instances, inaccuracies and confused statements.

For those with questions about the universe we live in, **The Heavens Are Telling** provides many answers, and will perhaps lead to further study of the exciting subject of astronomy. The author has anticipated this by concluding the book with a chapter, "What Other Books Can I Read?"

CECILE T. WEAVER
Berkeley, Calif.

GLEANINGS FOR ATM's

EDITED BY EARLE B. BROWN

A Large Portable Cassegrainian

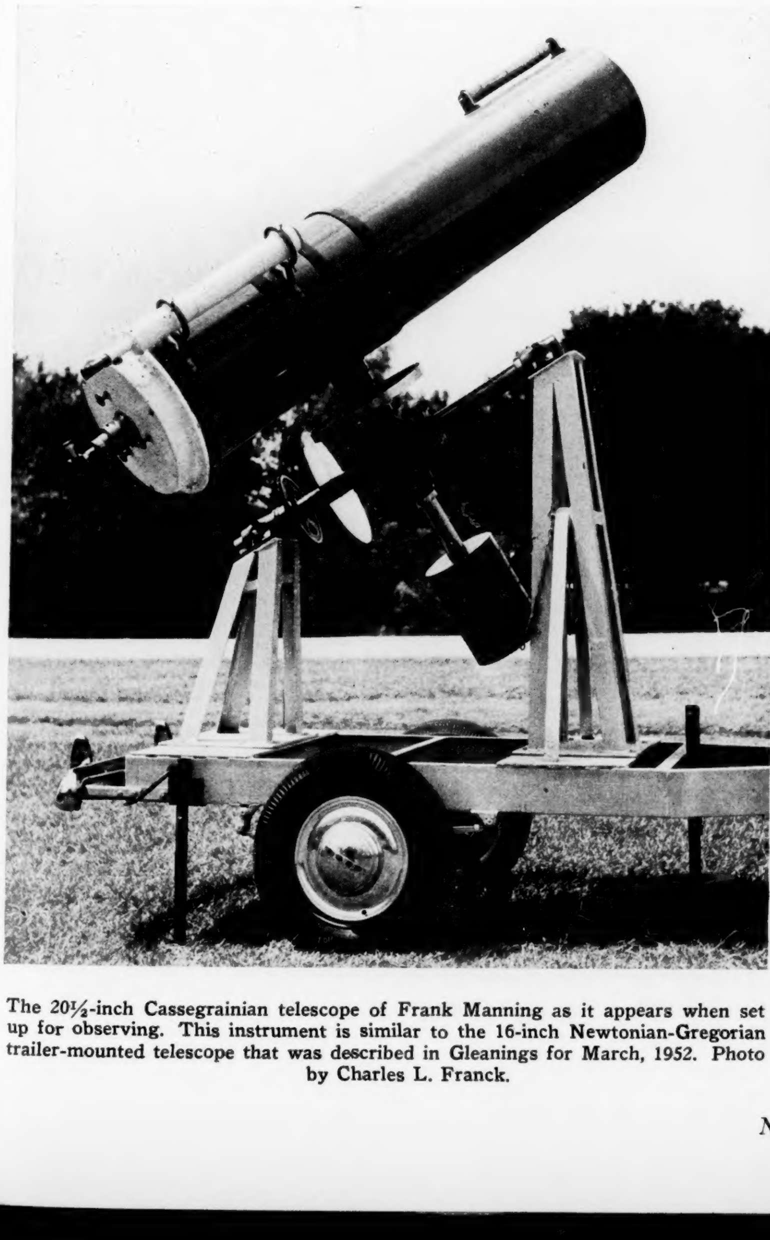
Recently, I completed the 20-inch portable Cassegrainian reflector pictured here. It has a 3¾" perforation, 100" focal length, and a 5-inch secondary. It has the usual 18-point flotation system for the mirror. The cell is of aluminum ½" thick.

The tube is made of a solid sheet of rolled aluminum, ¼" thick, lined with 3/16" cork insulation. The polar and declination axes are of 3" steel. The setting circles are 14" in diameter. Two pillar blocks and one thrust hold the polar axis. The declination axis sets in roller bearings, and there is a control hand wheel with a brake shoe inside the housing for locking declination. The polar axis is set at 29½° north latitude. The finder contains a 3¼-inch war-surplus lens.

The trailer is all steel. It is brought to a level position by a permanently installed jack system, each jack having a 12"-diameter steel disk attached for firm emplacement. The counterbalance weight is 500 pounds, in chunks of 50 and 100 pounds. The electric worm drive is not shown in the picture. I intend to add a mechanical clock drive as I expect to make observations in areas away from electric service, although the automobile generator and battery may be utilized for this purpose.

This instrument, which I believe is about the largest portable telescope ever built, performs very well. It is well balanced, and stays in adjustment even after travel over some very rough roads. The total weight of trailer and telescope is about one ton. Only a few minutes are required to put it into operation upon arrival at an observing site.

I had made several 6-inch instruments, but did not fully realize the amount of work involved in a 20-inch Cassegrainian



The 20½-inch Cassegrainian telescope of Frank Manning as it appears when set up for observing. This instrument is similar to the 16-inch Newtonian-Gregorian trailer-mounted telescope that was described in Gleanings for March, 1952. Photo by Charles L. Franck.

setup. Nevertheless, this instrument performs beyond my expectations. For instance, with a wide-angle Erfle eyepiece I obtain a beautiful view (sectional) of the minutest details of the craters and ridges of the moon.

FRANK W. MANNING
4321 Perrier St.
New Orleans 15, La.

A CLOCK-DRIVE MOUNTING FOR CAMERA AND TELESCOPE

An amateur need not even own a telescope to be able to photograph (on any fast film) more stars than he can see visually. What is needed is a simplified and accurate motor drive such as I have built into the mounting pictured here. The 3½-inch Newtonian telescope is simply clamped in a rectangular cradle held with a few screws. Behind the telescope is a second cradle on which may be clamped my 4-by-5 Crown Graphic for taking pictures of the sky directly; this camera is mounted with only two screws.

Of course, the camera's field of view is not obstructed by the telescope; in fact, the latter may be used at the same time as the camera. I use a supersensitive film and expose for 35 minutes, aperture wide open. The drive is set in operation, the shutter opened, and excellent results are obtained without manual guiding at any time.

At a separate place on the mounting my 35-mm. candid camera may be attached for obtaining color photographs of the constellations. There is a new thrill for stargazers in viewing the very familiar Big Dipper projected in color and over 26

Unguided star pictures with lenses of short focal length are possible with this mounting and its clock drive. The large base permits other cameras to be mounted.

inches in size. Kodachrome should be exposed for about half an hour or longer; the results are especially enjoyable indoors on a rainy night.

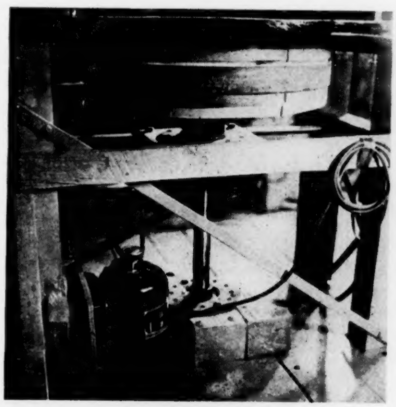
The polar-axis shaft is a steering column from an old Dodge car; it has a tapered roller bearing at the bottom end to take the thrust. The polar-axis drive wheel is of cast concrete (nails driven into the shaft are molded in concrete). The wheel is 2″ thick with an accurately ground outside diameter of 22.862″. This is the correct size to compensate for atmospheric refraction, and it provides the correct driving speed when a standard synchronous electric clock is used. Around the wheel is strapped a shipping crate steel band, to insure a smooth-riding surface, which rides on two 1″ ball bearings for the top support of the polar axis. Six brass bolts are cast near the perimeter of the upper surface of the wheel, and to these are fastened the experimental support mountings for the cameras, the declination axis, and the like.

The drive is powered by gravity. A durable line or cord is attached to the periphery of the wheel, and at the other end of the line there is a 3½-pound weight. Also attached to the same anchorage on the wheel (but coming from the opposite side) is a "music-wire" drive belt. The wire lies across the already mentioned critical diameter of 22.862 inches, and is attached to a most simplified constant-release mechanism consisting of a 6″ ¼-20 screw thread. This screw is prevented from turning by a press-fit cross pin set at right angles to the screw; the ends of the pin ride in a guide. Over this screw, a nut (which is pressed into the end of a tube) turns at one revolution per minute. This speed is provided by a small synchronous electric clock or timer. Each inch of thread is equivalent to a standard clock time of 20 minutes; therefore, the six inches of thread allow a two-hour exposure. While I did not provide a ball bearing to take up the end thrust of the ¼-20 drive screw on my first model, I am planning to do so when I rebuild it. This will permit using a heavier weight for the gravity drive.

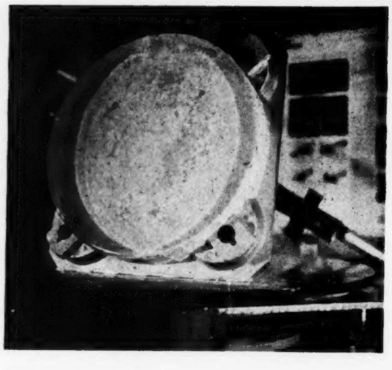
LOUIS MUSSGNUG
Hoyt's Hill Rd.
Bethel, Conn.

A GRINDING MACHINE FOR AMATEURS

A SIMPLY CONSTRUCTED grinding machine, capable of handling mirrors 12 to 24 inches in diameter, has recently been completed by Alvin F. Rose, Robert Miles, and myself. Members of our group, which is known as the Ervin Space Tech-



The vertical shaft and motor drive of the grinding machine built by the Ervin Space Technicians of North Sacramento.



Testing the 20½-inch telescope mirror on the machine by means of the tilting turntable.

nicians, are grinding a 20½-inch mirror blank.

The floor base of the machine is 4′ by 5′. It stands 36″ high, and has a 36″ turntable at the top. This turntable is made of 1″ plywood, and is mounted on a 22″ laminated wood pulley with a 1⅝″ shaft aligned in ball bearings. The power is applied to this pulley by a 2½″ rubber belt that runs to a 2½″ pulley on a counter shaft and gear train, with a gear reduction of seven to one. This in turn is driven by a V-belt from a 2″ pulley and a ¼-horsepower motor to an 8″ pulley on the counter shaft. The turntable running speed is 20 revolutions per minute.

On top of the turntable is a piece of plywood 22″ square, hinged at one edge. On this are the lugs for holding the blank during grinding; the hinges permit the mirror to be tilted for testing as shown in the illustration. This arrangement assists in keeping the center alignment.

A support on the back of the machine carries a pivoted arm to which are attached the grinding tools. The machine runs very quietly with no vibration.

We have 8-mm. color movies of the construction of the grinding machine, to which will be added a complete record of the mirror-grinding operations. These pictures will be available free to clubs and groups at a later date.

WILLIAM A. ERVIN
1932 Auburn Blvd.
North Sacramento, Calif.

THIS MONTH'S MEETINGS

(Continued from page 12)

Pittsburgh, Pa.: Amateur Astronomers Association, 8:00 p.m., Buhl Planetarium. Nov. 14, Dr. N. E. Wagman, Allegheny Observatory, "Astrometric Binaries."

Port Arthur, Tex.: Port Arthur Astronomy Club, 7:30, home of Mr. and Mrs. W. C. Piggott, 5228 Fifth St. Nov. 13, Gerrit van den Berg, "Lunar and Planetary Observations."

Washington, D. C.: National Capital Astronomers, 8:15 p.m., Commerce Building auditorium. Nov. 1, Dr. Dorrit Hoffleit, Harvard College Observatory, "From the Bottom of the Sea to the Top of the Atmosphere."

OBSERVER'S PAGE

Universal time is used unless otherwise noted.

AN OPPORTUNITY FOR AN OBSERVER

THE PHYSICS DEPARTMENT of the University of New Mexico is engaged in a research program covering the investigation of the zodiacal light. This work is under the sponsorship of the Air Force Cambridge Research Center, Air Research and Development Command.

The instrumentation for this program has been completed and consists of automatic photoelectric recording equipment at the physics department's Capillo Peak observatory, 60 miles southeast of Albuquerque at an elevation of 9,200 feet.

The observatory has primitive but adequate living quarters for one or two observers. These quarters are furnished without cost but must be maintained by the occupants. The location can be reached in less than two hours driving time from Albuquerque, and continuous radio contact is maintained between the physics department and the observatory.

An applicant for the position must be well versed in electronics, because of additional development work which will become necessary during the course of the program. He should have experience with a variety of electrical equipment, with photographic techniques, and should be prepared for routine maintenance of gasoline-driven power plants. There is considerable driving involved and, on several occasions during the winter, the mountainous part of the road is difficult to negotiate. The department maintains the necessary specialized vehicles for this purpose.

To a rugged individual who is interested in the astronomical problem at hand, this job should prove a stimulating experience. Applicants should write to Dr. Victor H. Regener, Department of Physics, University of New Mexico, 1929 Lomas Blvd., NE, Albuquerque, N. M.

NOVEMBER METEORS

Two minor showers may be favorably observed this month. First, the Taurids are at maximum from November 3rd to 10th, extending to November 22nd. The moon is full on the 1st; therefore evening observations can be made a week later. The Taurids can be observed in the evening, the radiant being about 10° south of the Pleiades. The meteors are slow-moving. On the other hand, the Leonid meteor display, at maximum on November 13th, may be viewed only in the morning. These meteors are extremely swift, many with trains. The predicted rates for each shower are six per hour under favorable conditions.

E. O.

UNIVERSAL TIME (UT)

TIMES used on the Observer's Page are Greenwich civil or Universal time, unless otherwise noted. This is 24-hour time, from midnight to midnight; times greater than 12:00 are p.m. Subtract the following hours to convert to standard times in the United States: EST, 5; CST, 6; MST, 7; PST, 8. If necessary, add 24 hours to the UT before subtracting, and the result is your standard time on the day preceding the Greenwich date shown.

AN ECLIPSE REPORT

Photographs and a detailed report on the partial phases of the annular eclipse of August 20th have been received from Jean Nicolini, Romulo Argentiere, and Orlando Zambardino, of the Capricorn Observatory, Sao Paulo, Brazil. The central line of the eclipse passed across extreme southern Brazil, but these amateurs remained at home to observe a 67-per-cent partial eclipse.

A series of 50 photographs was taken, using an 8-inch reflector and red and green filters. Visual observations were made with a 12-inch reflector, through a thin layer of clouds. The newspapers had been notified, with the result that public interest in the phenomenon was very great.

SUNSPOT NUMBERS

August 1, 36, 62; **2**, 32, 42; **3**, 38, 35; **4**, 46, 44; **5**, 46, 46; **6**, 43, 43; **7**, 52, 51; **8**, 57, 49; **9**, 59, 57; **10**, 54, 59; **11**, 46, 43; **12**, 58, 54; **13**, 53, 66; **14**, 49, 50; **15**, 45, 44; **16**, 42, 45; **17**, 46, 50; **18**, 41, 43; **19**, 32, 30; **20**, 26, 22; **21**, 31, 28; **22**, 40, 30; **23**, 58, 54; **24**, 59, 69; **25**, 66, 84; **26**, 72, 74; **27**, 93, 90; **28**, 81, 85; **29**, 75, 89; **30**, 85, 83; **31**, 89, 85. Means for August: 53.2 American; 55.0 Zurich.

Daily values of the observed mean relative sunspot numbers are given above. The first are the American numbers computed by Neal J. Heines from Solar Division observations; the second are the Zurich Observatory numbers.

OCCULTATION PREDICTIONS

November 2-3 **q Tauri** 4.4, 3:42.3 +24-19.1, 15, Im: **A** 9:56.9 —0.6 —1.5 97; **B** 9:52.1 —0.8 —1.3 88; **C** 10:00.4 —0.6 —2.1 113; **D** 9:49.8 —0.9 —1.6 98; **E** 9:45.1 —1.2 —2.6 120; **G** 8:56.0 —1.5 +0.3 77; **H** 8:56.5 ... ... 133; **I** 8:41.1 —1.5 +0.8 75. Em: **D** 10:54.7 —0.7 —0.7 250; **E** 10:43.7 —1.4 +0.6 225; **G** 10:12.8 —1.4 —0.3 255; **H** 9:39.2 ... ... 192; **I** 9:59.4 —1.6 +0.2 252.

November 2-3 **20 Tauri** 4.0, 3:43.0 +24-13.2, 15, Im: **A** 10:19.9 —0.2 —2.5 123; **B** 10:12.6 —0.4 —2.2 114; **C** 10:31.7 +0.4 —4.6 148; **D** 10:14.8 —0.4 —2.9 127; **G** 9:18.0 —1.7 —1.2 107; **I** 9:02.9 —1.9 —0.7 107. Em: **G** 10:24.1 —1.4 +0.9 227; **I** 10:09.1 —1.4 +1.6 222.

November 20-21 **Sigma Sagittarii** 2.1, 18:52.3 —26-21.5, 3, Im: **A** 22:13.8 —0.8 —0.2 53; **B** 22:12.6 —0.7 —0.1 45; **C** 22:10.0 —1.0 0.0 53; **D** 22:08.0 —0.8 +0.2 40. Em: **C** 23:17.6 —1.1 —1.0 267; **E** 22:53.5 —2.2 —1.5 294.

November 22-23 **Theta Capricorni** 4.2, 21:03.3 —17-25.5, 6, Im: **H** 4:10.7 —0.7 0.0 57; **I** 4:15.6 +0.2 +1.1 11.

November 25-26 **Lambda Piscium** 4.6, 23:39.6 +1-31.0, 9, Im: **F** 5:27.9 +0.1 +4.1 355.

For standard stations in the United States and Canada, for stars of magnitude 5.0 or brighter, data from the **American Ephemeris** and the **British Nautical Almanac** are given here, as follows: evening-morning date, star name, magnitude, right ascension in hours and minutes, declination in degrees and minutes, moon's age in days, immersion or emersion; standard station designation, UT, **a** and **b** quantities in minutes, position angle on the moon's limb; the same data for each standard station westward.

The **a** and **b** quantities tabulated in each case are variations of standard-station predicted times per degree of longitude and of latitude, respectively, enabling computation of fairly accurate times for one's local station (long. **Lo**, lat. **L**) within 200 or 300 miles of a standard station (long. **LoS**, lat. **LS**). Multiply **a** by the difference in longitude (**Lo — LoS**), and multiply **b** by the difference in latitude (**L — LS**), with due regard to arithmetic signs, and add both results to (or subtract from, as the case may be) the standard-station predicted time to obtain time at the local station. Then convert the Universal time to your standard time.

Longitudes and latitudes of standard stations are:

A +72°.5, +42°.5	**E** +91°.0, +40°.0
B +73°.6, +45°.6	**F** +98°.0, +31°.0
C +77°.1, +38°.9	**G** +114°.0, +50°.9
D +79°.4, +43°.7	**H** +120°.0, +36°.0

I +123°.1, +49°.5

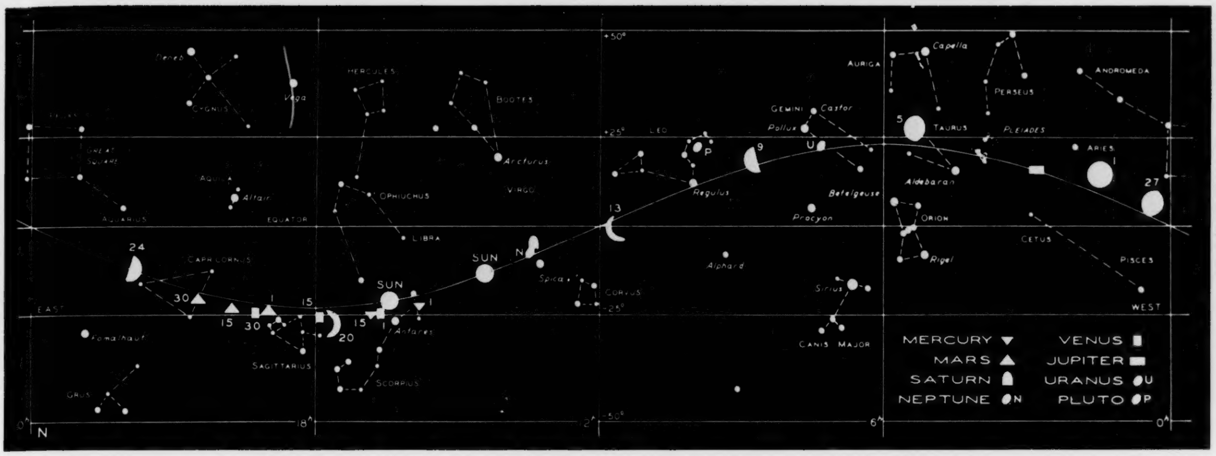
PREDICTIONS OF BRIGHT ASTEROID POSITIONS

Ceres, 1, 7.4. Nov. 4, 5:01.7 +18-20; 14, 4:54.8 +18-36; 24, 4:45.9 +18-52. Dec. 4, 4:35.9 +19-09; 14, 4:25.8 +19-27; 24, 4:17.0 +19-47.

Dembowska, 349, 9.5. Nov. 14, 5:02.6 +30-05; 24, 4:53.5 +30-28. Dec. 4, 4:43.2 +30-38; 14, 4:32.9 +30-37; 24, 4:23.8 +30-28. Jan. 3, 4:17.1 +30-13.

Hesperia, 69, 9.8. Nov. 24, 5:50.4 +10-26. Dec. 4, 5:43.5 +9-57; 14, 5:35.0 +9-40; 24, 5:26.0 +9-37. Jan. 3, 5:17.7 +9-48; 13, 5:11.3 +10-13.

After the asteroid's name are its number and the magnitude expected at opposition. At 10-day intervals are given its right ascension and declination (1952.0) for 0^h Universal time. In each case the motion of the asteroid is retrograde. Data supplied by the IAU Minor Planet Center at the University of Cincinnati Observatory.



THE SUN, MOON, AND PLANETS THIS MONTH

The sun, on the ecliptic, is shown for the beginning and end of the month. The moon's symbols give its phase roughly, with the date marked alongside. Each planet is located for the middle of the month and for other dates shown.

Mercury attains greatest eastern elongation on November 10th, 22° 59′ from the sun, at magnitude 0.0. However, this will not be a favorable apparition in mid-northern latitudes, for Mercury will be low in the southwest after sunset.

Venus continues to gain prominence in the evening sky as it moves eastward from the sun through Ophiuchus and Sagittarius, shining at magnitude −3.5. At the end of November, Venus will set 2½ hours after the sun.

Mars is located east of Venus in the evening sky, but considerably fainter at magnitude +0.9. Mars continues its eastward motion through Sagittarius and Capricornus, setting about four hours after the sun.

Jupiter reaches opposition with the sun on November 8th, 371 million miles from Earth. In the early evening one may see this brilliant planet in the east while Venus is in the southwest outshining Jupiter by a magnitude. At opposition, the Jovian disk appears 49″.3 in equatorial diameter, observable in field glasses.

Saturn, in the morning sky about 4° north of Spica in Virgo, is moving eastward, and is of magnitude +1.0.

Uranus rises in mid-evening, located about ½° north of Delta Geminorum, and is in retrograde motion. The slightest optical aid is sufficient for finding this distant planet, of the 6th magnitude.

Neptune, also moving eastward, is in the morning sky close to Saturn. Conjunction of the two planets takes place on November 18th, Saturn passing 43′ north. This is the first of a series of these conjunctions; there will be others next May and July. Neptune is an 8th-magnitude object.

E. O.

MINIMA OF ALGOL

November 1, 22:22; 4, 19:11; 7, 16:00; 10, 12:48; 13, 9:37; 16, 6:26; 19, 3:15; 22, 0:04; 24, 20:53; 27, 17:42; 30, 14:31. December 3, 11:20; 6, 8:09.

These predictions are geocentric (corrected for the equation of light), based on observations made in 1947. See **Sky and Telescope,** Vol. VII, page 260, August, 1948, for further explanation.

MOON PHASES AND DISTANCE

Full moon	November 1, 23:10
Last quarter	November 9, 15:43
New moon	November 17, 12:56
First quarter	November 24, 11:34
Full moon	December 1, 12:41

	November	Distance	Diameter
Apogee	10, 6^h	251,200 mi.	29′ 34″
Perigee	23, 8^h	230,000 mi.	32′ 17″
	December		
Apogee	8, 3^h	251,300 mi.	29′ 33″

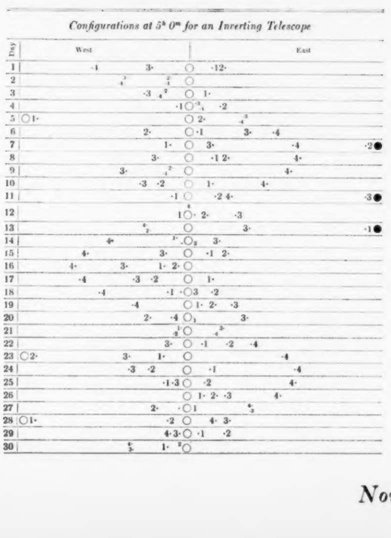
VARIABLE STAR MAXIMA

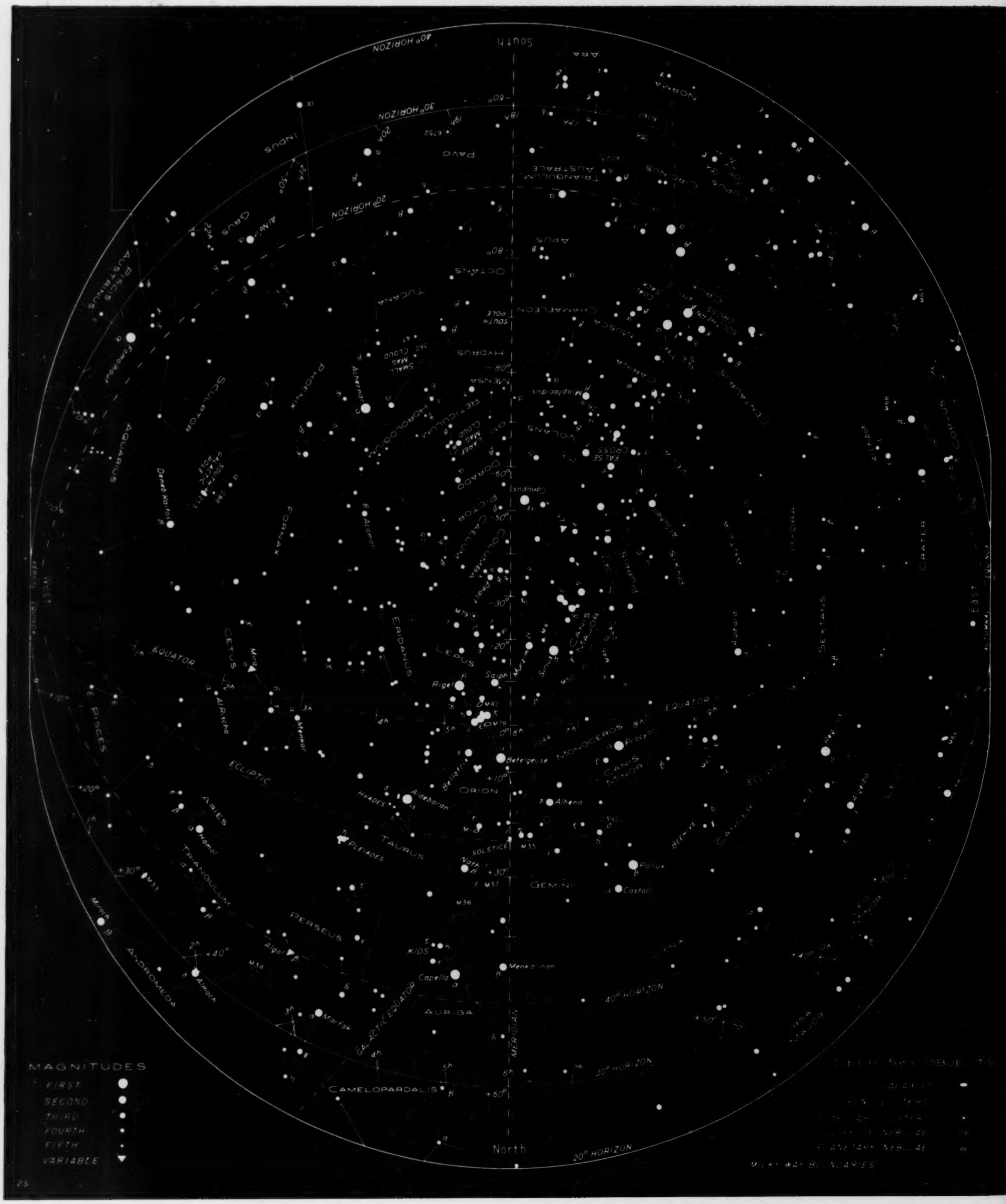
November 1, R Leporis, 6.7, 0455**14**; 2, R Normae, 7.2, 152**849**; 3, RT Cygni, 7.4, 194048; 4, U Cygni, 7.6, 201647; 13, X Monocerotis, 7.6, 065**208**; 13, R Virginis, 6.9, 123307; 16, Z Ursae Majoris, 6.6, 115158; 20, R Cygni, 7.3, 193449; 28, S Carinae, 5.7, 100**661**.

These predictions of variable star maxima are by the AAVSO. Only stars are included whose mean maximum magnitudes are brighter than magnitude 8.0. Some, but not all of them, are nearly as bright as maximum two or three weeks before and after the dates for maximum. The data given include, in order, the day of the month near which the maximum should occur, the star name, the predicted magnitude, and the star designation number, which gives the rough right ascension (first four figures) and declination (bold face if southern).

JUPITER'S SATELLITES

Jupiter's four bright moons have the positions shown below for the Universal time given. The motion of each satellite is from the dot to the number designating it. Transits of satellites over Jupiter's disk are shown by open circles at the left, eclipses and occultations by black disks at the right. The chart is from the **American Ephemeris and Nautical Almanac.**





The sky as seen from latitudes 20° to 40° south, at 9 p.m. and 8 p.m., local time, on the 7th and 23rd of February, respectively.

SOUTHERN STARS

SIRIUS and Canopus, the two brightest stars of the nighttime sky, shine overhead on summer evenings in the Southern Hemisphere. They are stars of very different kinds, one owing its brightness to its nearness, the other shining with an intrinsic luminosity some 1,900 times that of the sun. The first is a double star that includes the first white dwarf star known.

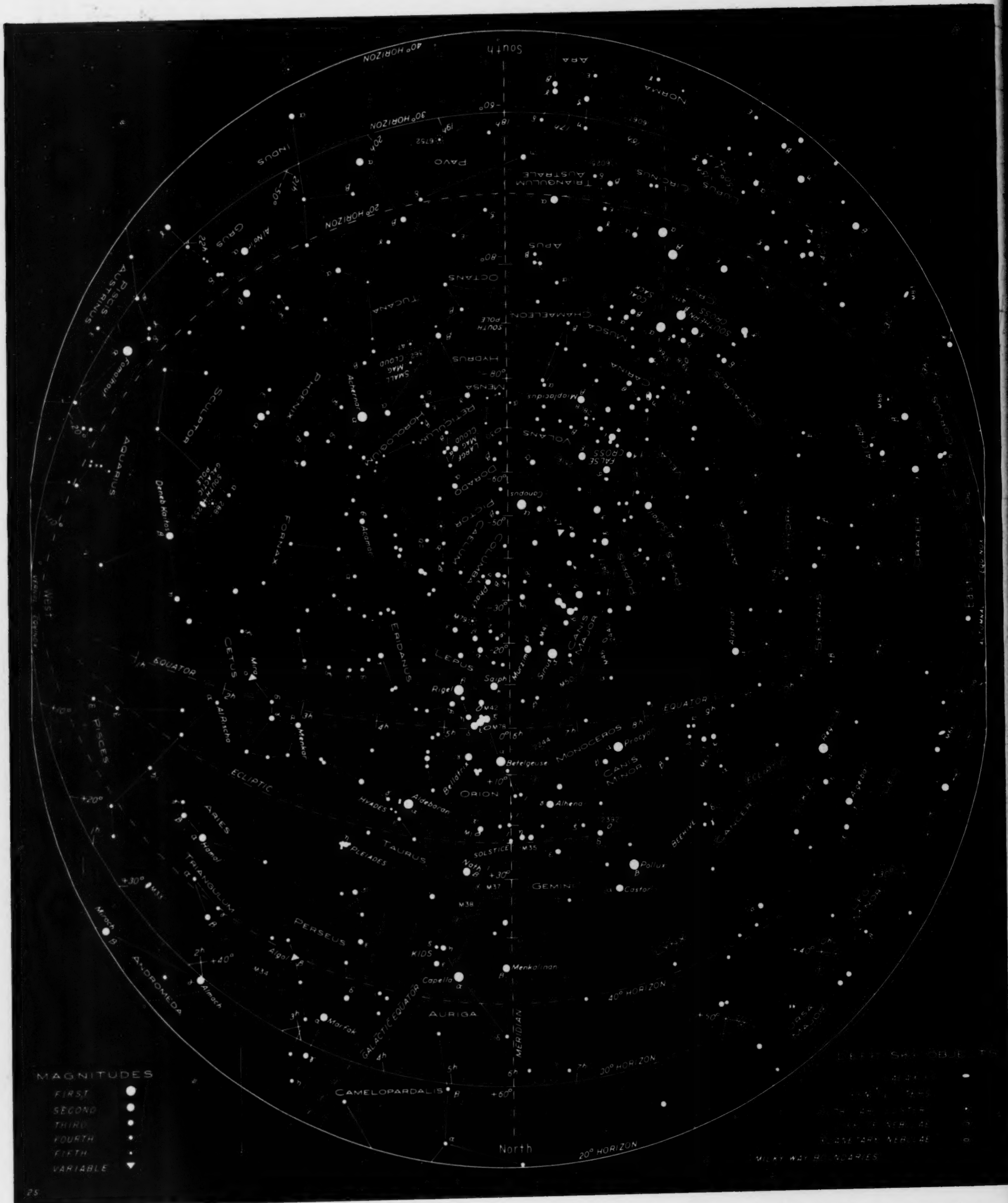
Sirius A has a visual magnitude of about −1.58, and is of spectral type **A**0, making it a typical white star. It is about 30 times as bright as the sun. Its companion is of magnitude 7.1, spectral type **A**5, absolute magnitude +10.0. Their parallax is 0.381 second of arc, corresponding to a distance from the sun of 8.6 light-years. The period of this binary pair is 50 years. Sirius A has 2.2 times the sun's mass, while Sirius B, in spite of its very low luminosity, is as massive as the sun. Its density is 50,000 times that of water.

Canopus is a yellowish star of spectral type **F**0, its parallax being 0.033 second of arc and its distance 100 light-years. Its visual magnitude is −0.86, absolute magnitude −3.2.

Sirius is Alpha Canis Majoris, brightest star of the Greater Dog, and Canopus, 36 degrees farther south in the sky, is the lucida of Carina, the Keel.

STARS FOR NOVEMBER

The sky as seen from latitudes 30° to 50° north, at 9 p.m. and 8 p.m., local time, on the 7th and 23rd of November, respectively; also, at 7 p.m. and 6 p.m. on December 7th and 23rd. For other times, add or subtract ½ hour per week. When facing north, hold "North" at th turn the chart correspondingly directions. The projection (ster shows celestial co-ordinates as



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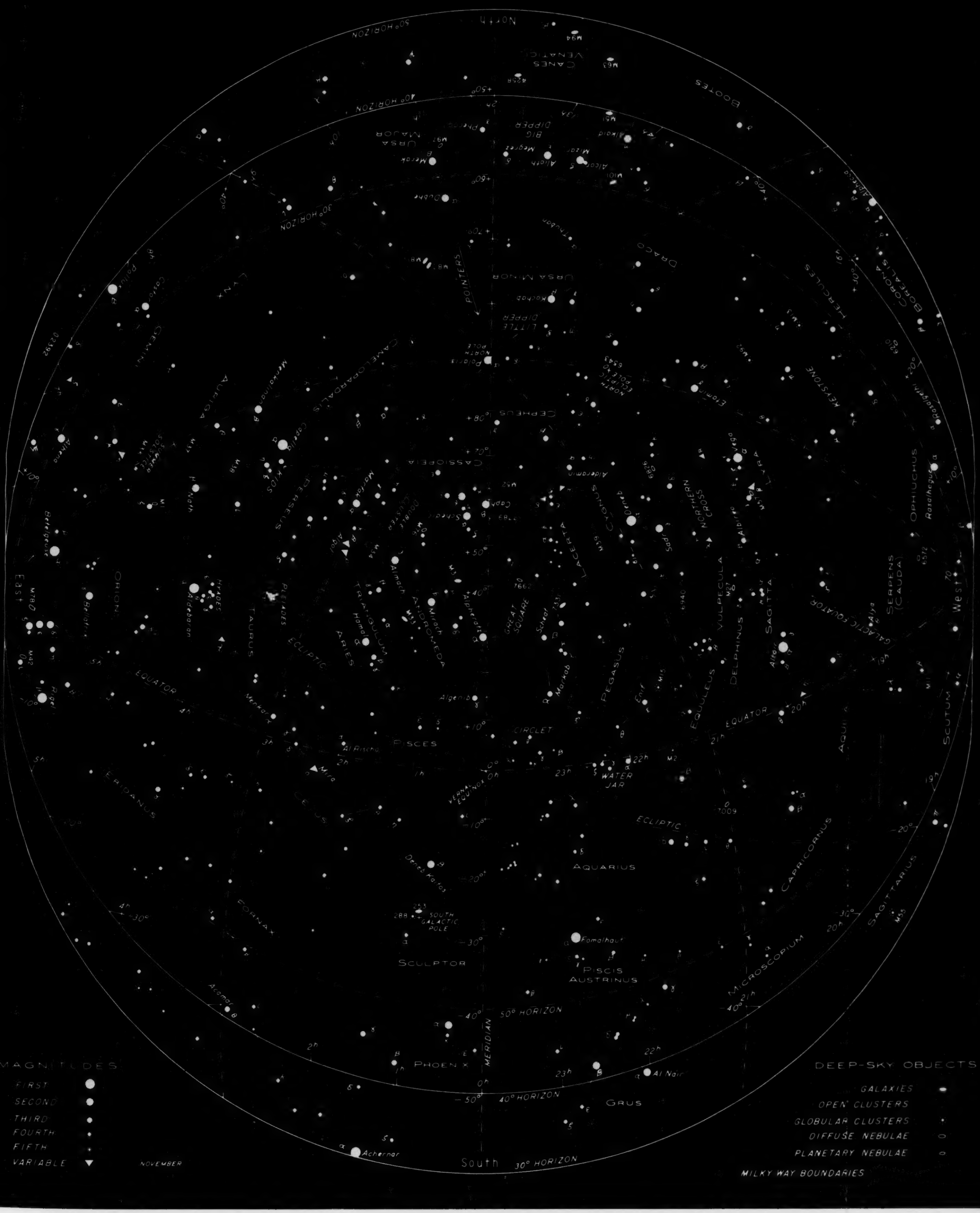

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